



# **Fort Bragg North Carolina**

**US Army Corps  
of Engineers  
Savannah District**

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## **Solicitation Number**

**DACA21-03-R-0046**

**Indefinite Delivery Order Contract for Construction and  
Design/Build Construction**

**Volume II of III - Sample Task Order - Widen Range Road,  
Range 19, SOTF (SF 00012-2)**

**FY-03, Line Item 3332000**

**July 2003**

**THIS SOLICITATION IS UNRESTRICTED PURSUANT TO THE  
"BUSINESS OPPORTUNITY DEVELOPMENT REFORM ACT OF 1988"  
(PUBLIC LAW 100-656)**

**U.S. ARMY ENGINEER DISTRICT, SAVANNAH  
CORPS OF ENGINEERS  
100 WEST OGLETHORPE AVENUE  
SAVANNAH, GEORGIA 31401-3640**

# OFFEROR FEE PROPOSAL

## Sample Project Task Order

Widen Range Road, Project Number SF 00012-2 and SiteWork and Storage Facility, Project Number SF 00006-0  
DACA21-03-R-0046

Work Item	Labor	Equipment	Material	TOTAL
Mobilization & Site Layout/Survey				\$0.00
Cleanup/Trash Removal & Demobilization				\$0.00
Miscellaneous Lump Sum (Project sign, Temporary Toilet Facilities, etc.)				\$0.00
<u>Widen Range Road, SF 00012-2 Base Bid</u>				
Excavation and Hauling				\$0.00
2" Asphalt base course				\$0.00
1" Asphalt wearing course				\$0.00
Base Course Compaction				\$0.00
Water Distribution				\$0.00
Silt Fence				\$0.00
4" Striping				\$0.00
12" Striping				\$0.00
Stop Signs and Posts				\$0.00
<u>Site Work and Storage Facility, SF 00006-0 Base Bid</u>				
Demolition				\$0.00
Excavation, Grading, and Hauling				\$0.00
Asphalt Paving				\$0.00
Concrete Curb and Gutter				\$0.00
Concrete Sidewalk and Pads				\$0.00
Chain Link Fence and Posts				\$0.00
Retaining Wall				\$0.00
Precast Manhole				\$0.00
Frame and Gate				\$0.00
15"RCP				\$0.00
18"CMP				\$0.00
8"CMP				\$0.00
15"RCP Flared End Section				\$0.00
Silt Fence				\$0.00
Riprap Stone				\$0.00

# OFFEROR FEE PROPOSAL

## Sample Project Task Order

Widen Range Road, Project Number SF 00012-2 and SiteWork and Storage Facility, Project Number SF 00006-0  
DACA21-03-R-0046

Utilities				\$0.00
<u>Site Work and Storage Facility, SF 00006-0 Option 1</u>				
Concrete Foundations and Slab				\$0.00
Concrete Walls				\$0.00
Steel 'Work				\$0.00
Roof Fans				\$0.00
Bollards				\$0.00
Concrete Roof Slab				\$0.00
Roofing & Roof Insulation				\$0.00
Electrical				\$0.00
TOTAL DIRECT COSTS	\$0.00	\$0.00	\$0.00	\$0.00
Field Overhead	_____ %			
Field Overhead on Subcontract Work	Tot Subcontracts _____ %			
Home Office Overhead	_____ %			
TOTAL COSTS				\$0.00
Profit	_____ %			
Bond Premium	_____ %			
TOTAL PROPOSED FEE				\$0.00

\*1

### NOTES:

1. Attach Subcontractor quotes and reference applicable work item.
2. Base Bid Construction Duration 240 Calendar Days which includes 50 weather days.
3. Option 1 Construction Duration 180 Calendar Days which includes 30 weather days.
4. Option 1 may be awarded at any time during the life of the task order.

## SCOPE OF WORK

17 July 2003

TASK ORDER FOR WIDEN RANGE ROAD, PROJECT NUMBER SF 00012-2, and SITE WORK and STORAGE FACILITY, PROJECT NUMBER SF-00006-0, FORT BRAGG, NC

**1. DESCRIPTION OF WORK:** Widen existing 12-foot road to 24 feet and construction road, parking lot, and storage building, complete, in accordance with project plans and specifications.

**2. PERFORMANCE PERIOD:** Base Bid 240 Calendar Days  
Option 1 180 Calendar Days

### 3. CONTRACT REQUIREMENTS:

A. Project Involves Handling of Asbestos:

☐ Yes (See Section \_\_\_\_\_)

☒ No

B. Occupancy During Construction:

☐ Yes (See Section 01500)

☒ No

C. Phasing of Work:

☒ Yes Widen Range Road, SF 00012-2 - One lane of Range Road must remain open at all times.

☐ No

D. Construction Schedule

☒ Bar Chart

☐ NAS

### 4. PRE-BID CONFERENCE:

☐ Yes Date \_\_\_\_\_ Time \_\_\_\_\_ Location \_\_\_\_\_ POC/Telephone \_\_\_\_\_

☒ No

### 5. CONTRACTOR REQUIREMENTS:

A. After task order award:

☒ FRP0001 – Site Safety and Health Plan

☒ FRP0002 – Quality Control Program

☒ FRP0007 – Work Plan

☒ FRP0009 - Pre-Remediation Action Conference

☒ FRP0010 – Work Schedule

☒ FRP0011 - Weekly Progress Report

☒ FRP0016 - Equipment and Construction Warranties

B. After construction completion, prior to final payment:

☒ FRP0021 - As-Built/Final Drawings

### 6. GOVERNMENT-FURNISHED ITEMS/WORK: None

**7. INTERFACE WITH GOVERNMENT PERSONNEL:** Access to and from the site shall be coordinated through the North Carolina Air Force and Special Projects Office, POC Bob Cagle at telephone number (910) 432-8121.

**8. WAGE DETERMINATION:** The applicable wage rate number is NC03011.

## CONTINUED

\*1 \*2

**9. LIQUIDATED DAMAGES:** The Contractor shall be assessed the amount of \$~~551,825~~.00 liquidated damages per calendar day, for failure to complete the prescribed work within the performance period stated in paragraph 2, above.

**10. PAYMENT OFFICE:** North Carolina Air Force and Special Projects Office  
Attn: Bob Cagle  
Bldg. D2507 Ardennes Street  
Fort Bragg, NC 29307-0247

## 11. ENCLOSURES:

### A. SPECIFICATIONS:

Widen Range Road (Project Number SF 00012-2) – 01005 w/ SECURITY PROCEDURES GUIDE, 01330, 01451, 01500, 01780, 02013, 02220, 02230, 02300, 02316, 02370, 02510, 02722, 02741, 02763, 02821

Site Work and Storage Facility – 01005 w/ SECURITY PROCEDURES GUIDE, 01330, 01355, 01451, 01500, 01780, 02220, 02230, 02300, 02315, 02316, 02364, 02370, 02510, 02722, 02742, 02763, 02770, 02821, 02921, 03151, 03200, 03300, 03410, 04200, 06100, 07220, 07530, 07900, 09900, 16110, 16512, 16524

**B. DRAWINGS:** Widen Ranger Road – PWBC 6357 Sheets 1-8  
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SECTION 01005

GENERAL AND SPECIAL PROVISIONS

PART 1 SCOPE OF WORK

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SECTION 01005

GENERAL AND SPECIAL PROVISIONS

PART 1 SCOPE OF WORK

The work consists of furnishing all labor, equipment, transportation, and materials necessary to perform all work in strict accordance with these specifications, schedules, applicable PWBC Drawings, and other contract documents. The scope of work of this contract includes, but is not limited to, the following specific items of work:

1.1 Civil Work. Provide complete widening of road per drawings.

1.2 Architectural Work. None.

1.3 Mechanical Work. None.

1.4 Electrical Work. None.

2. PROJECT REQUIREMENTS:

2.1 Certificates of Compliance and Material Submittals. The Contractor shall submit for approval all certificates of compliance and material submittals required in these technical provisions. Required submittals shall be submitted for approval not later than 30 days prior to the approval date needed to achieve compliance with the approved project schedule. Approval must be received from the Contracting Officer or his representative before incorporating the materials into the work. The Contractor shall provide a Submittal Register listing all required submittals in the contract to the COR at the time of the first submittal. Submittal forms (form 59-2-R) and a sample Submittal Register (Form 4288) will be provided at the Prework Conference.

2.2 Safety and Environmental Plans. The Contractor shall submit a proposed safety plan in accordance with the current Corps of Engineers Safety Manual, EM-385-1-1, and shall submit an environmental protection plan in accordance with specifications section 01355, Environmental Protection, if included in these technical provisions. A sample safety plan form will be provided at the Prework Conference.

2.3 Quality Control. The Contractor shall provide the job superintendent's name and telephone number to the Construction Management Division of the PWBC; building 3-1933, Butner Road; (910) 396-2308, prior to commencement of work. The Contractor shall furnish a daily Contractor Quality Control (CQC)/Superintendent's work report to the Contracting Officer's Representative (COR). A sample CQC report form will be provided at the Prework Conference.

2.4 Excavation Permit. The Contractor shall have a completed and approved PWBC Excavation Permit in his possession prior to any excavation, to include sign or fence-post holes. The Contractor shall schedule an appointment to locate utility lines at least 24 hours prior to any excavation with the PWBC Facilities Maintenance Division, building 3-1634, Butner Road. Utilities are usually located within 5-10 workdays from the date of request but, due to weather conditions, construction workloads, etc., longer periods of time for these utility locates may be experienced. This will be accomplished by submitting a Facilities Maintenance Division Service Order. Service Orders



are obtained by calling (910) 396-0321, or making the request on-line at <http://www/bragg/army/mil/pwbc/>. Service Order status can also be checked on-line at the same web address. A copy of the PWBC Excavation Permit form will be provided at the Prewrite Conference. The Contractor shall be responsible for coordination with the Information Technology Business Center (ITBC), Outside Plant Branch; building 1-1434, Scott Street; (910) 396-8200, for locating government-owned communication lines prior to any excavation. The Contractor shall also be responsible for coordination with any known or suspected non-governmental utilities such as Sprint telecommunications or cable television.

## 2.5 Disposal and Borrow Permits.

2.5.1 Disposal Permits. A permit is required to use the installation land clearing and inert debris and demolition landfills. Landfill permits shall be processed with the Environmental Compliance Branch of the PWBC Environmental & Natural Resources Division; building 3-1333, Butner Road; (910) 432-6336/-6352. Permits are issued for 60 days duration and for the specific contract only. Only materials produced on the project for which the permits are issued may be disposed of in the land clearing and inert debris and demolition landfills. The Contractor shall sort the debris for like materials, such as construction and debris materials, inert debris, etc. All metal products should be brought to the landfill separately and placed in the applicable container. The Contractor shall keep a copy of the completed permit with the vehicle throughout the contract disposal operation. Copies of the disposal permit forms will be provided at the Prewrite Conference. The land clearing and inert debris and demolition debris disposal site locations are shown on the drawings. Landfills and transfer site are open for customer service from 0730 to 1500 Monday through Friday except Federal holidays. When directed by the Contracting Officer the landfills may be available on an as-required basis for 2 to 6 hours approximately 12 weekends per year (Saturday, Sunday & Holiday).

2.5.2 Borrow Permits. A permit is required to use the Fort Bragg borrow material pits. Borrow pit permits shall be processed with the PWBC Facilities Maintenance Division, Roads and Equipment Branch; Building O-3454, Lamont Road, 396-6873. Permits are issued for the life of the specific contract only. Borrow materials may only be used on the project for which the permits are issued. The Contractor shall keep a copy of the completed permit with the vehicle throughout the contract borrow operation. Copies of the borrow permit forms will be provided at the Prewrite Conference. The borrow pit location is shown on the drawings.

2.6 Haul Routes. The Contractor is required to use the haul routes shown on the contract drawings for transportation of borrow materials, construction debris, or demolition materials unless otherwise permitted in writing by the COR. When haul routes are not designated in the contract, the Contractor must obtain approval from the COR for the routes he intends to use. The axle load of earth-hauling equipment operating on paved streets shall not exceed 12,000 pounds.

2.7 Utility Outages and Road Closures. Utility, road, and railroad closures require minimum 10 working days advance written notice and will be subject to COR approval. A sample utility outage/road closure request form will be provided at the Prewrite Conference. Utility outages will be held on normal work days, after hours or on weekend/holidays as coordinated with the Contracting Officer, Ft. Bragg PWBC and the utility provider. The decision on when to have an outage (normal work hours, weekend, etc) will be based on the length of the outage and the normal business hours/hours of maximum usage for

the facilities affected by the outage. Outages will be limited to a duration of 4 hours unless extenuating circumstances dictate otherwise. In the case of road closures, a sketch shall be provided showing the closure location and all necessary signs and barricades. Necessary signage, barricades, flagpersons, lights (including temporary traffic control lights), and markings for the safe movement of the public during construction shall be in accordance with the Manual on Uniform Traffic Control Devices, and shall be provided at no additional expense to the Government.

## 2.8 Availability and Use of Utility Services.

2.8.1 Payment for Utility Services. The Government will make all reasonably required utilities available to the Contractor from existing outlets and supplies, as specified in the contract. Unless otherwise provided in the contract, the amount of each utility service consumed shall be charged to and paid for by the Contractor at the prevailing rates. The rates listed below are current as of January 1, 2003 and are subject to change. The Contractor shall carefully conserve all utilities furnished.

2.8.2 Meters and Temporary Connections. The Contractor, at its expense and in a manner satisfactory to the Contracting Officer, shall provide and maintain necessary temporary connections, distribution lines, and meters required to measure the amount of each utility used for the purpose of determining charges. The Contractor shall notify the Contracting Officer's Representative, in writing, no less than 10 working days before the temporary connection is made. The Contracting Officer's Representative will then provide the contractor with the name and phone number of the utility provider. The contractor will be responsible for contacting the utility provider and making arrangements for connections and billing. For temporary electrical connections the Government or applicable utility provider will provide the meter (meter base provided by contractor) and make the final hot connection after inspection and approval of the Contractor's temporary wiring installation. The Contractor shall not make the final electrical connection. For temporary water and sewer connections the contractor will provide the meter and after inspection/approval by the Contracting Officer's Representative make the final connection at the contractor's expense.

2.8.3 Use of Permanent Building Utility Connections. Utilities consumed by the contractor from permanent building utility connections shall also be metered and paid for by the contractor. When the permanent system is activated the initial meter reading shall be recorded and reported as specified below. On building renovation projects the initial meter reading shall be recorded when the contractor is given possession of the building to perform the work. The contractor shall pay for utilities consumed through the permanent building connection until the work has been completed or the government has occupied the facility, whichever occurs first.

2.8.4 Initial Meter Readings. Upon installation of the meter, the initial reading shall be recorded (in the presence of the Contracting Officer's Representative) and forwarded to the point of contact for utility service with a copy to the Contracting Officer's Representative.

2.8.5 Final Meter Reading. Before completion of the work and final acceptance of the work by the Government, the Contractor shall notify the Contracting Officer and the applicable utility provider, in writing, 10 working days before termination is desired. The Government or applicable utility provider will take a final meter reading. Electric service will be disconnected by the provider. Water and sewer connections will be disconnected by the contractor, at his expenses and by a method approved by

the Contracting Officer's Representative. The Contractor shall then remove all the temporary distribution lines, meters, meter bases, and associated paraphernalia. The Contractor shall pay all outstanding utility bills before final acceptance of the work by the Government.

2.8.6 Requirement for backflow prevention on temporary/permanent potable water connections. The contractor shall install a backflow prevention device on all connections to the potable water system. The backflow prevention device shall be a reduced pressure or double check type, meeting all the State code requirements for backflow preventers on potable water. If the contractor request the use of a fire hydrant and receives approval from the Contracting Officer's Representative a backflow prevention device and meter shall be installed prior to each use.

#### 2.8.7 Utilities Charge Rates

Water ----- \$1.9585 per 1,000 gallons  
Electricity ----- \$0.0752 per KW hour  
Sewer ----- \$10.00/month for each connected trailer up to single wide size. The rate for larger trailers will be determined by the utility provider, however, this rate will not exceed \$20.00/month per trailer.

2.9 As-Built Record Drawings. The Contractor shall be responsible for maintaining one set of master prints at the job-site on which he shall keep a careful and neat record of all deviations from the original contract drawings as the work progresses. The Contractor shall note all changes and corrections on these record drawings promptly as the changes occur, but in no case less often than a weekly basis. In addition to incorporated modifications, these record drawings shall also include the actual location of all subsurface utility lines installed or encountered, and the type of materials used. Contractor will receive a copy of the contract documents in an electronic format (CD or 3.5 inch diskette) at the time of award, the Contractor shall be responsible for transferring any as-built changes and plan sheet annotations described above onto the electronic format documents. The marked-up/annotated prints, or the annotated electronic drawings if applicable, shall be certified as to their correctness by an authorized representative of the Contractor and turned-over to the COR not later than 10 days after acceptance of the work by the Government.

### 3. SPECIAL PROVISIONS:

3.1 Contractor Vehicle/Equipment Access to Fort Bragg. Fort Bragg is not a closed installation, but vehicular access is controlled. Contractors are required to register each vehicle that will be traveling installation roads or streets under its own power. Each such vehicle shall have a registration decal. Registration may be accomplished at the Main Vehicle Registration Center, building 8-1078 on Randolph Street near Bragg Boulevard, 0800-1700 hours Monday through Friday. Unregistered vehicles should expect be stopped and delayed at all access control points. Contractors and all commercially registered vehicles shall use the Knox Street access control point off Bragg Boulevard for all access to Fort Bragg.

3.2 Special Access Requirements. Access to SOTF Compound is done only through a special security system for personnel and vehicles. See SECURITY PROCEDURES GUIDE included at the end of this section for these security requirements.

-- End of Section --

**SECURITY PROCEDURES GUIDE**

**For the design and construction of Project**

**WIDEN RANGE ROAD, RANGE 19, SOTF  
SF 00012-2**

**SECURITY OPERATIONS TRAINING FACILITY**

## SECTION 1

### GENERAL

1. This Security Procedures Guide is issued for the design and construction of Project SF 00012-2, WIDEN RANGE ROAD, RANGE 19,, SOTF. Project documents will be classified a minimum of FOUO.

2. Reference:

a. AR 380-5, DA Information Security Program Regulation dated 25 February 1988.

b. DOD 5220.22-M, Industrial Security Manual, dated January 1991.

3. Purpose: The purpose of this Security Procedures Guide is to provide guidance and established procedures for the uniform handling and control of all information on SOTF projects that are originated, dispatched, and/or received by any SOTF project element.

4. Applicability: This guide is applicable to all personnel granted access to information and material related to SOTF. Access to project data and information is on a strict "NEED TO KNOW" basis. In all cases, the most stringent requirements of Reference 2a and b, and this manual apply. SOTF project elements will be subject to unannounced and random inspections by SOTF Security Personnel to insure compliance with this manual.

5. The SOTF Security/OPSEC Manager is Mrs. Mary Beth Bobenmoyer, telephone (910) 396-0914. The SOTF Project Manager is Mr. Roger Whatley, telephone (910) 396-0976.

6. Background: SOTF is a Department of the Army secure training facility. Design and construction drawings, specifications, and design analysis of this SOTF project cannot be provided to any other country, except as approved by the Security Manager.

## SECTION 2

### SPECIAL SECURITY PROCEDURES

#### 1. Responsibilities:

a. Commanders and/or heads of organizations in which SOTF material is originated, dispatched, received and/or stored, will insure that this security Procedures Guide is on hand and that all SOTF project personnel are thoroughly familiar with its contents.

b. Each individual entrusted with SOTF documents regardless of classification or protective marking (FOUO, is responsible for the proper control, accountability, and safeguarding of same.

#### 2. Access:

a. Access to FOUO information on SOTF projects will be limited to US Citizens who have a valid "need to know". In the event that access to classified information is required, an additional security procedures guide will be furnished.

b. To gain access to the SOTF site and/or project information, a written or telephonic request must be made to the SOTF Project Manager at least one week in advance (Enclosure 1). A separate request must be made for each site visit.

c. Once access has been granted, no SOTF information or site access will be given to the individual until he or she has signed a Security Briefing Form (Enclosure 2). The original form will be sent to the SOTF Security Manager.

(1) Use of Escorts: Personnel entering the Security Operations Training Facility will be escorted by a facility member or by a security guard. Use of escorts within the facility is done routinely for contracted personnel regardless of their security clearance level.

(2) Work Hours: Normal work hours for contract personnel to conduct business within SOTF are 0730 - 1600, Monday thru Friday. Contractor personnel will report to the SOTF Visitor Center each day at 0730 to exchange a valid picture identification for a SOTF visitor badge. All contractor vehicles will be searched each day starting at 0730. Once the badge exchange and vehicle search is complete, the contractor will convoy with the escort to the job sit. The Contractor must exit the SOTF compound by 1600 each day. Exceptions will be approved by the Project Manager and must be coordinated two days in advance.

3. Information Controls:

a. Work Areas: A separate work area will be established where large volumes of project information are processed, discussed, or stored. This is required to preclude compromise of project information by unauthorized personnel.

b. Communications: Nonsecure telephone circuits will not be used to discuss any sensitive SOTF information or data. Nonsecure facsimile equipment may be used only for the transmission of unclassified SOTF information.

4. Release of Information: Public release of any SOTF information regardless of classification is NOT authorized. Any attempts by unauthorized personnel to obtain SOTF information or data will be reported immediately to the SOTF Security Manager by the most expeditious means available.

5. Storage: Unclassified SOTF project information must be stored in a locked, segregated container located in the SOTF work area. At no time will SOTF information be left unsecured within the work area when it is not being worked on. FOUO cover sheets should be used whenever appropriate

6. Transmission:

a. "FOR OFFICIAL USE ONLY" material may be sent by Certified mail or U.S. Express mail.

b. All envelopes or packages containing SOTF "FOUO" material will be addressed to the official government activity or organization with attention to a specific individual by name. Return address will note specific individual in attention line. The envelope will be clearly marked with the caveat "DELIVER TO AND TO BE OPENED BY ADDRESSEE ONLY". This caveat will be displayed in letters at least 1/4 inch in height. The protective marking "FOR OFFICIAL USE ONLY" shall NOT be stamped on the envelope. The envelope shall be carefully sealed with tape.

REQUEST FOR ACCESS

SOTF PROJECT: \_\_\_\_\_

DATE: \_\_\_\_\_

ORGANIZATION \_\_\_\_\_

NAME & TITLE OF NOMINEE \_\_\_\_\_

SSN \_\_\_\_\_ TELEPHONE \_\_\_\_\_

ACCESS IS REQUIRED FOR PROJECT INFORMATION \_\_\_\_\_ AND/OR SOTF SITE  
VISIT \_\_\_\_\_

REQUESTED ACCESS LEVEL \_\_\_\_\_

JUSTIFICATION/ COMMENTS \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

DATE/TIME OF SITE VISIT \_\_\_\_\_

REQUESTOR \_\_\_\_\_

-----  
To be completed by requestors Security Officer:

SECURITY CLEARANCE OF NOMINEE \_\_\_\_\_

CLEARANCE GRANTED BY \_\_\_\_\_ ON \_\_\_\_\_

\_\_\_\_\_  
SECURITY OFFICER

\_\_\_\_\_  
SIGNATURE

\_\_\_\_\_  
DATE

-----  
To be completed by SOTF Access Approving Official:

ACCESS To SOTF PROJECT INFORMATION \_\_\_\_\_ AND/OR SOTF SITE \_\_\_\_\_

IS APPROVED/DISAPPROVED

APPROVED ACCESS LEVEL: \_\_\_\_\_

COMMENTS \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_  
APPROVING OFFICIAL

\_\_\_\_\_  
SIGNATURE

\_\_\_\_\_  
DATE



DEPARTMENT OF THE ARMY  
US ARMY SECURITY OPERATIONS TRAINING FACILITY  
Post Office Box 70660  
Fort Bragg. North Carolina 28307-5000

SECURITY BRIEFING

I, \_\_\_\_\_, understand that, by virtue of my assignment, employment, or association on this sensitive Department of the Army Facility/Project, of the Security Operations Training Facility (SOTF), I may be granted access, if properly authorized/ security cleared, to information, material, and plans which concern the security of the United States of America and which are either sensitive or classified by order of the President or as authorized by statute.

1. I understand that I may never divulge, publish, or reveal by writing, word, conduct, or otherwise, to any unauthorized person, any classified or sensitive information relating to the SOTF Facility/ Project, its personnel, fiscal data or security measures without prior consent of the Director, SOTF or his designated representative.

2. I understand that the burden is upon me to ascertain whether or not information is classified, and, if so, who is authorized to receive it. I will, therefore, obtain the decision of the authorizing officials of the SOTF Security Office on these matters before disclosing such information.

3. I must submit for review to an appropriate DOD official prior to discussing with or showing to any publisher, literary agent, architectural firm, or other unauthorized persons, all manuscripts, articles, speeches, resumes, all architectural design drawings and papers, written or drawn by me or in conjunction with others, which contain or are derived from information or material obtained by virtue of my assignment, employment or association with the SOTF Facility/Project. I understand that the purpose of such review is to ensure that no sensitive or classified information or material obtained by virtue of my assignment, employment or association with this facility/project contained therein. I further understand that such review shall not constitute nor shall be represented as a verification or factual accuracy or an endorsement of the opinions contained in any such manuscripts, articles, speeches, resumes, or papers.

4. I understand that all classified or sensitive information acquired by me in connection with my assignment, employment or association with this facility/project remains the property of the Government of the United States of America, and I must surrender, upon demand by appropriate DOD official, or upon separation from this SOTF Facility/project, any material in my possession relating to such information.

5. I must report without delay to my superior the details or circumstances of any case which comes within my knowledge wherein an

unauthorized person has obtained or is attempting to obtain classified, or sensitive information or material, or wherein such information or material, may be or is being displayed or removed in an unauthorized manner.

6. I understand that my compliance with all the obligations required to protect classified information may be a consideration of my continuing assignment, employment or association with this facility/project. I understand that any failure to so comply may subject me to administrative action including termination of my assignment, employment or association with this facility/ project.

7. I have read and understand the provisions of the Espionage Act, Sections, 793, 794, and 798, of Title 18, United States Code, and I am aware of the penalties provided for any violation thereof. I understand that the provisions of the Espionage Act apply during my assignment, employment or association with the SOTF Facility/Project.

8. I have read and understand the contents of this briefing. I have read and understand Section 1001 of Title 18, United States Code, regarding the making of false, fictitious, or fraudulent statements or representations, and I am aware of the penalties provided for any violation thereof.

PERSON CONDUCTING BRIEFING

PERSON BEING BRIEFED

\_\_\_\_\_  
(DATE)

\_\_\_\_\_  
(DATE)

\_\_\_\_\_  
(PRINTED OR TYPED NAME)

\_\_\_\_\_  
(PRINTED OR TYPED NAME)

\_\_\_\_\_  
(SSAN)

\_\_\_\_\_  
(SSAN)

\_\_\_\_\_  
(ORGANIZATION/FIRM)

\_\_\_\_\_  
(ORGANIZATION/FIRM)

\_\_\_\_\_  
(SIGNATURE)

NOTICE: THE PRIVACY ACT, 5 U.S.C. 552a, requires that federal agencies inform individuals, at the time information is solicited from them, whether the disclosure is mandatory or voluntary, by what authority such information is solicited, and what uses will be made of the information. You are hereby advised that the authority for soliciting your Social Security Account Number (SSAN) is Executive Order 9397. Your SSAN will be used to identify you precisely when it is necessary to certify that you have access to the information indicated above. While your disclosure of SSAN is not mandatory, your failure to do so may delay the processing of such certification.

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DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01330

SUBMITTAL PROCEDURES

**09/00**

PART 1 GENERAL

- 1.1 SUBMITTAL IDENTIFICATION
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-- End of Section Table of Contents --

SECTION 01330

SUBMITTAL PROCEDURES  
09/00

PART 1 GENERAL

1.1 SUBMITTAL IDENTIFICATION

Submittals required are identified by SD numbers and titles as follows:

- SD-01 Preconstruction Submittals
- SD-02 Shop Drawings
- SD-03 Product Data
- SD-04 Samples
- SD-05 Design Data
- SD-06 Test Reports
- SD-07 Certificates
- SD-08 Manufacturer's Instructions
- SD-09 Manufacturer's Field Reports
- SD-10 Operation and Maintenance Data
- SD-11 Closeout Submittals

1.2 SUBMITTAL CLASSIFICATION

Submittals are classified as follows:

1.2.1 Government Approved

Government approval is required for extensions of design, critical materials, deviations, equipment whose compatibility with the entire system must be checked, and other items as designated by the Contracting Officer. Within the terms of the Contract Clause entitled "Specifications and Drawings for Construction," they are considered to be "shop drawings."

1.2.2 Information Only

All submittals not requiring Government approval will be for information only. They are not considered to be "shop drawings" within the terms of the Contract Clause referred to above.

1.3 APPROVED SUBMITTALS

The Contracting Officer's approval of submittals shall not be construed as a complete check, but will indicate only that the general method of construction, materials, detailing and other information are satisfactory. Approval will not relieve the Contractor of the responsibility for any error which may exist, as the Contractor under the Contractor Quality Control (CQC) requirements of this contract is responsible for dimensions,

the design of adequate connections and details, and the satisfactory construction of all work. After submittals have been approved by the Contracting Officer, no resubmittal for the purpose of substituting materials or equipment will be considered unless accompanied by an explanation of why a substitution is necessary.

#### 1.4 DISAPPROVED SUBMITTALS

The Contractor shall make all corrections required by the Contracting Officer and promptly furnish a corrected submittal in the form and number of copies specified for the initial submittal. If the Contractor considers any correction indicated on the submittals to constitute a change to the contract, a notice in accordance with the Contract Clause "Changes" shall be given promptly to the Contracting Officer.

#### 1.5 WITHHOLDING OF PAYMENT

Payment for materials incorporated in the work will not be made if required approvals have not been obtained.

#### PART 2 PRODUCTS (Not used)

#### PART 3 EXECUTION

##### 3.1 GENERAL

The Contractor shall make submittals as required by the specifications. The Contracting Officer may request submittals in addition to those specified when deemed necessary to adequately describe the work covered in the respective sections. Units of weights and measures used on all submittals shall be the same as those used in the contract drawings. Each submittal shall be complete and in sufficient detail to allow ready determination of compliance with contract requirements. Prior to submittal, all items shall be checked and approved by the Contractor's Quality Control (CQC) System Manager and each item shall be stamped, signed, and dated by the CQC System Manager indicating action taken. Proposed deviations from the contract requirements shall be clearly identified. Submittals shall include items such as: Contractor's, manufacturer's, or fabricator's drawings; descriptive literature including (but not limited to) catalog cuts, diagrams, operating charts or curves; test reports; test cylinders; samples; O&M manuals (including parts list); certifications; warranties; and other such required submittals. Submittals requiring Government approval shall be scheduled and made prior to the acquisition of the material or equipment covered thereby. Samples remaining upon completion of the work shall be picked up and disposed of in accordance with manufacturer's Material Safety Data Sheets (MSDS) and in compliance with existing laws and regulations.

##### 3.2 SUBMITTAL REGISTER

At the end of this section is a submittal register showing items of equipment and materials for which submittals are required by the specifications; this list may not be all inclusive and additional submittals may be required. Contractor will also be given the submittal register files, containing the computerized ENG Form and instructions on the use of the files. These submittal register files will be furnished on a separate diskette. Columns "c" through "f" have been completed by the Government; the Contractor shall complete columns "a", "b" and "g" through "r" and submit the forms (hard copy plus associated electronic file) to the

Contracting Officer for approval within 30 calendar days after Notice to Proceed. The Contractor shall keep this diskette up-to-date and shall submit it to the Government together with the monthly payment request. The approved submittal register will become the scheduling document and will be used to control submittals throughout the life of the contract. The submittal register and the progress schedules shall be coordinated.

### 3.3 SCHEDULING

Submittals covering component items forming a system or items that are interrelated shall be scheduled to be coordinated and submitted concurrently. Certifications to be submitted with the pertinent drawings shall be so scheduled. Adequate time (a minimum of 21 calendar days exclusive of mailing time) shall be allowed and shown on the register for review and approval. No delay damages or time extensions will be allowed for time lost in late submittals.

### 3.4 TRANSMITTAL FORM (ENG FORM 4025)

The sample transmittal form (ENG Form 4025) attached to this section shall be used for submitting both Government approved and information only submittals in accordance with the instructions on the reverse side of the form. These forms are included in the RMS-QC software that the Contractor is required to use for this contract. This form shall be properly completed by filling out all the heading blank spaces and identifying each item submitted. Special care shall be exercised to ensure proper listing of the specification paragraph and/or sheet number of the contract drawings pertinent to the data submitted for each item.

### 3.5 SUBMITTAL PROCEDURE

Submittals shall be made as follows:

#### 3.5.1 Deviations

For submittals which include proposed deviations requested by the Contractor, the column "variation" of ENG Form 4025 shall be checked. The Contractor shall set forth in writing the reason for any deviations and annotate such deviations on the submittal. The Government reserves the right to rescind inadvertent approval of submittals containing unnoted deviations.

### 3.6 CONTROL OF SUBMITTALS

The Contractor shall carefully control his procurement operations to ensure that each individual submittal is made on or before the Contractor scheduled submittal date shown on the approved "Submittal Register."

### 3.7 GOVERNMENT APPROVED SUBMITTALS

Upon completion of review of submittals requiring Government approval, the submittals will be identified as having received approval by being so stamped and dated. Two copies of the submittal will be retained by the Contracting Officer and three copies of the submittal will be returned to the Contractor.

### 3.8 INFORMATION ONLY SUBMITTALS

Normally submittals for information only will not be returned. Approval of

the Contracting Officer is not required on information only submittals. The Government reserves the right to require the Contractor to resubmit any item found not to comply with the contract. This does not relieve the Contractor from the obligation to furnish material conforming to the plans and specifications; will not prevent the Contracting Officer from requiring removal and replacement of nonconforming material incorporated in the work; and does not relieve the Contractor of the requirement to furnish samples for testing by the Government laboratory or for check testing by the Government in those instances where the technical specifications so prescribe.

### 3.9 STAMPS

Stamps used by the Contractor on the submittal data to certify that the submittal meets contract requirements shall be similar to the following:

CONTRACTOR	
(Firm Name)	
_____	Approved
_____ Approved with corrections as noted on submittal data and/or attached sheets(s).	
SIGNATURE: _____	
TITLE: _____	
DATE: _____	

-- End of Section --



# SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION

WIDEN RANGE ROAD, RANGE 19, SOTF

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH	GOVT CLASSIFICATION OR REFERENCE NUMBER	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION		DATE FWD TO APPR AUTH/	APPROVING AUTHORITY				MAILED TO CONTR/  DATE RCD FRM APPR AUTH	REMARKS
						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION		DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE	DATE OF ACTION	
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		01780	SD-02 Shop Drawings														
			As-Built Drawings	1.2.1	G												
		02220	SD-03 Product Data														
			Work Plan		G												
		02230	SD-03 Product Data														
			Materials Other Than Salable	3.4.2													
			Timber														
		02300	SD-03 Product Data														
			Earthwork														
			SD-06 Test Reports														
			Testing	3.13													
		02316	SD-06 Test Reports														
			Field Density Tests	3.4.3													
			Testing of Backfill Materials	3.4.2													
		02370	SD-02 Shop Drawings														
			Layout	3.2.2													
			Obstructions Below Ground	3.2.4													
			Erosion Control	3.2.2													
			SD-03 Product Data														
			Geotextile Fabrics	2.1	G												
			SD-04 Samples														
			Materials														
		02510	SD-03 Product Data														
			Installation	3.1													
			Satisfactory Installation														
			SD-06 Test Reports														

# SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION

WIDEN RANGE ROAD, RANGE 19, SOTF

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH	GOVT CLASSIFICATION OR REFERENCE NUMBER	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION		DATE FWD TO APPR AUTH/  DATE RCD FROM CONTR	APPROVING AUTHORITY				MAILED TO CONTR/  DATE RCD FRM APPR AUTH	REMARKS
						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION		DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE	DATE OF ACTION		
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		02510	Bacteriological Disinfection	3.3.1													
		02722	SD-03 Product Data														
			Plant, Equipment, and Tools	1.6													
			Waybills and Delivery Tickets														
			SD-06 Test Reports														
			Sampling and testing	1.4													
			Field Density Tests	1.4.2.4													
		02741	SD-03 Product Data														
			Mix Design	2.3													
			G.														
			Contractor Quality Control	3.10	G												
			Material Acceptance and Percent	3.11	G												
			Payment														
			SD-04 Samples														
			Asphalt Cement Binder	2.2													
			Aggregates	2.1													
			SD-06 Test Reports														
			Aggregates	2.1													
			G.														
			QC Monitoring	3.10.3.10													
			SD-07 Certificates														
			Asphalt Cement Binder	2.2	G												
			Testing Laboratory	3.6													
		02763	SD-03 Product Data														
			Equipment	1.4													
			G.														



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DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01420

SOURCES FOR REFERENCE PUBLICATIONS

**08/02**

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 ORDERING INFORMATION

-- End of Section Table of Contents --

SECTION 01420

SOURCES FOR REFERENCE PUBLICATIONS  
**08/02**

PART 1 GENERAL

1.1 REFERENCES

Various publications are referenced in other sections of the specifications to establish requirements for the work. These references are identified in each section by document number, date and title. The document number used in the citation is the number assigned by the standards producing organization, (e.g. ASTM B 564 Nickel Alloy Forgings). However, when the standards producing organization has not assigned a number to a document, an identifying number has been assigned for reference purposes.

1.2 ORDERING INFORMATION

The addresses of the standards publishing organizations whose documents are referenced in other sections of these specifications are listed below, and if the source of the publications is different from the address of the sponsoring organization, that information is also provided. Documents listed in the specifications with numbers which were not assigned by the standards producing organization should be ordered from the source by title rather than by number.

ACI INTERNATIONAL (ACI)  
P.O. Box 9094  
Farmington Hills, MI 48333-9094  
Ph: 248-848-3700  
Fax: 248-848-3701  
Internet: <http://www.aci-int.org>

AIR CONDITIONING AND REFRIGERATION INSTITUTE (ARI)  
4301 North Fairfax Dr., Suite 425  
ATTN: Pubs Dept.  
Arlington, VA 22203  
Ph: 703-524-8800  
Fax: 703-528-3816  
E-mail: [ari@ari.org](mailto:ari@ari.org)  
Internet: <http://www.ari.org>

AIR CONDITIONING CONTRACTORS OF AMERICA (ACCA)  
2800 Shirlington Road, Suite 300  
Arlington, VA 22206  
Ph: 703-575-4477  
FAX: 703-575-4449  
Internet: <http://www.acca.org>

AIR DIFFUSION COUNCIL (ADC)  
1000 East Woodfield Road, Suite 102  
Shaumburg, IL 60173-5921  
Ph: 847-706-6750  
Fax: 847-706-6751  
Internet: <http://www.flexibleduct.org>

AIR MOVEMENT AND CONTROL ASSOCIATION (AMCA)  
30 W. University Dr.  
Arlington Heights, IL 60004-1893  
Ph: 847-394-0150  
Fax: 847-253-0088  
Internet: <http://www.amca.org>

ALUMINUM ASSOCIATION (AA)  
  
900 19th Street N.W.  
Washington, DC 20006  
Ph: 202-862-5100  
Fax: 202-862-5164  
Internet: <http://www.aluminum.org>

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)  
1827 Walden Ofc. Sq.  
Suite 104  
Schaumburg, IL 60173-4268  
Ph: 847-303-5664  
Fax: 847-303-5774  
Internet: <http://www.aamanet.org>

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS  
(AASHTO)  
444 N. Capital St., NW, Suite 249  
Washington, DC 20001  
Ph: 800-231-3475 202-624-5800  
Fax: 800-525-5562 202-624-5806  
Internet: <http://www.aashto.org>

AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS (AATCC)  
P.O. Box 12215  
Research Triangle Park, NC 27709-2215  
Ph: 919-549-8141  
Fax: 919-549-8933  
Internet: <http://www.aatcc.org>

AMERICAN BEARING MANUFACTURERS ASSOCIATION (ABMA)  
2025 M Street, NW, Suite 800  
Washington, DC 20036  
Ph: 202-367-1155  
Fax: 202-367-2155  
Internet: <http://www.abma-dc.org>

AMERICAN BOILER MANUFACTURERS ASSOCIATION (ABMA)  
4001 North 9th Street, Suite 226  
Arlington, VA 22203-1900  
Ph: 703-522-7350  
Fax: 703-522-2665  
Internet: <http://www.abma.com>

AMERICAN CONCRETE PIPE ASSOCIATION (ACPA)  
222 West Las Colinas Blvd., Suite 641  
Irving, TX 75039-5423  
Ph: 972-506-7216 or 800-290-2272  
Fax: 972-506-7682  
Internet: <http://www.concrete-pipe.org>

e-mail: [info@concrete-pipe.org](mailto:info@concrete-pipe.org)

AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH)  
1330 Kemper Meadow Dr.  
Suite 600  
Cincinnati, OH 45240  
Ph: 513-742-2020  
Fax: 513-742-3355  
Internet: <http://www.acgih.org>  
E-mail: [pubs@acgih.org](mailto:pubs@acgih.org)

AMERICAN FOREST & PAPER ASSOCIATION (AF&PA)  
American Wood Council  
ATTN: Publications Dept.  
1111 Nineteenth St. NW, Suite 800  
Washington, DC 20036  
Ph: 800-294-2372 or 202-463-2700  
Fax: 202-463-2471  
Internet: <http://www.afandpa.org/awc/>

AMERICAN GAS ASSOCIATION (AGA)  
400 N. Capitol St. N.W. Suite 450  
Washington, D.C. 20001  
Ph: 202-824-7000  
Fax: 202-824-7115  
Internet: <http://www.aga.org>

AMERICAN GAS ASSOCIATION LABORATORIES (AGAL)  
400 N. Capitol St. N.W. Suite 450  
Washington, D.C. 20001  
Ph: 202-824-7000  
Fax: 202-824-7115  
Internet: <http://www.aga.org>

AMERICAN GEAR MANUFACTURERS ASSOCIATION (AGMA)  
1500 King St., Suite 201  
Alexandria, VA 22314-2730  
Ph: 703-684-0211  
Fax: 703-684-0242  
Internet: <http://www.agma.org>

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)  
One East Wacker Dr., Suite 3100  
Chicago, IL 60601-2001  
Ph: 312-670-2400  
Publications: 800-644-2400  
Fax: 312-670-5403  
Internet: <http://www.aisc.org>

AMERICAN INSTITUTE OF TIMBER CONSTRUCTION (AITC)  
7012 So. Revere Parkway, Suite 140  
Englewood, CO 80112  
Ph: 303-792-9559  
Fax: 303-792-0669  
Internet: <http://www.aitc-glulam.org>

AMERICAN IRON AND STEEL INSTITUTE (AISI)  
1101 17th St., NW Suite 1300  
Washington, DC 20036

Ph: 202-452-7100  
Internet: <http://www.steel.org>

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)  
1819 L Street, NW, 6th Floor  
Washington, DC 20036  
Ph: 202-293-8020  
Fax: 202-293-9287  
Internet: <http://www.ansi.org/>

Note --- Documents beginning with the letter "S" can be ordered from:

Acoustical Society of America  
Standards and Publications Fulfillment Center  
P. O. Box 1020  
Sewickley, PA 15143-9998  
Ph: 412-741-1979  
Fax: 412-741-0609  
Internet: <http://asa.aip.org>  
General e-mail: [asa@aip.org](mailto:asa@aip.org)  
Publications e-mail: [asapubs@abdintl.com](mailto:asapubs@abdintl.com)

AMERICAN NURSERY AND LANDSCAPE ASSOCIATION (ANLA)  
1250 I St., NW, Suite 500  
Washington, DC 20005-3922  
Ph: 202-789-2900  
FAX: 202-789-1893  
Internet: <http://www.anla.org>

AMERICAN PETROLEUM INSTITUTE (API)  
1220 L St., NW  
Washington, DC 20005-4070  
Ph: 202-682-8000  
Fax: 202-682-8223  
Internet: <http://www.api.org>

AMERICAN PUBLIC HEALTH ASSOCIATION (APHA)  
800 I Street, NW  
Washington, DC 20001  
PH: 202-777-2742  
FAX: 202-777-2534  
Internet: <http://www.apha.org>

AMERICAN RAILWAY ENGINEERING & MAINTENANCE-OF-WAY ASSOCIATION  
(AREMA)  
8201 Corporate Dr., Suite 1125  
Landover, MD 20785-2230  
Ph: 301-459-3200  
Fax: 301-459-8077  
Internet: <http://www.arema.org>

AMERICAN SOCIETY FOR NONDESTRUCTIVE TESTING (ASNT)  
1711 Arlingate Lane  
P.O. Box 28518  
Columbus, OH 43228-0518  
Ph: 800-222-2768  
Fax: 614-274-6899  
Internet: <http://www.asnt.org>



AMERICAN SOCIETY FOR QUALITY (ASQ)  
600 North Plankinton Avenue  
Milwaukee, WI 53202-3005  
Ph: 800-248-1946  
Fax: 414-272-1734  
Internet: <http://www.asq.org>

ASTM INTERNATIONAL (ASTM)  
  
100 Barr Harbor Drive  
West Conshohocken, PA 19428-2959  
Ph: 610-832-9585  
Fax: 610-832-9555  
Internet: <http://www.astm.org>

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)  
1801 Alexander Bell Drive  
Reston, VA 20191-4400  
Ph: 703-295-6300 - 800-548-2723  
Fax: 703-295-6222  
Internet: <http://www.asce.org>  
e-mail: [marketing@asce.org](mailto:marketing@asce.org)

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING  
ENGINEERS (ASHRAE)  
1791 Tullie Circle, NE  
Atlanta, GA 30329  
Ph: 800-527-4723 or 404-636-8400  
Fax: 404-321-5478  
Internet: <http://www.ashrae.org>

AMERICAN SOCIETY OF SANITARY ENGINEERING (ASSE)  
901 Canterbury, Suite A  
Westlake, OH 44145  
Ph: 440-835-3040  
Fax: 440-835-3488  
E-mail: [asse@ix.netcom.com](mailto:asse@ix.netcom.com)  
Internet: <http://www.asse-plumbing.org>

AMERICAN WATER WORKS ASSOCIATION(AWWA)  
6666 West Quincy  
Denver, CO 80235  
Ph: 800-926-7337 - 303-794-7711  
Fax: 303-794-7310  
Internet: <http://www.awwa.org>

AMERICAN WELDING SOCIETY (AWS)  
550 N.W. LeJeune Road  
Miami, FL 33126  
Ph: 800-443-9353 - 305-443-9353  
Fax: 305-443-7559  
Internet: <http://www.amweld.org>

AMERICAN WOOD-PRESERVERS' ASSOCIATION (AWPA)  
P.O. Box 5690  
Grandbury, TX 76049-0690  
Ph: 817-326-6300  
Fax: 817-326-6306

Internet: <http://www.awpa.com>

APA - THE ENGINEERED WOOD ASSOCIATION (APA)  
P.O.Box 11700  
Tacoma, WA 98411-0700  
Ph: 253-565-6600  
Fax: 253-565-7265  
Internet: <http://www.apawood.org>

ARCHITECTURAL & TRANSPORTATION BARRIERS COMPLIANCE BOARD (ATBCB)

The Access Board  
1331 F Street, NW, Suite 1000  
Washington, DC 20004-1111  
PH: 202-272-5434  
FAX: 202-272-5447  
Internet: <http://www.access-board.gov>

ARCHITECTURAL WOODWORK INSTITUTE (AWI)  
1952 Isaac Newton Square West  
Reston, VA 20190  
Ph: 703-733-0600  
Fax: 703-733-0584  
Internet: <http://www.awinet.org>

ASBESTOS CEMENT PIPE PRODUCERS ASSOCIATION (ACPPA)  
PMB114-1745 Jefferson Davis Highway  
Arlington, VA 22202  
Ph: 514-861-1153  
Fax: 514-861-1152  
Internet: None

ASM INTERNATIONAL (ASM)  
9639 Kinsman Road  
Materials Park, OH 44073-0002  
Ph: 440-338-5151  
Fax: 440-338-4634  
Internet: <http://www.asm-intl.org>  
Order Publications From:  
ASM International  
ATTN: MSC/Book Order  
P.O. Box 473  
Novelty, OH 44072-9901

ASME INTERNATIONAL (ASME)  
Three Park Avenue  
New York, NY 10016-5990  
Ph: 212-591-7722  
Fax: 212-591-7674  
Internet: <http://www.asme.org>

ASPHALT INSTITUTE (AI)  
Research Park Dr.  
P.O. Box 14052  
Lexington, KY 40512-4052  
Ph: 859-288-4960  
Fax: 859-288-4999  
Internet: <http://www.asphaltinstitute.org>

ASSOCIATED AIR BALANCE COUNCIL (AABC)  
1518 K St., NW, Suite 503  
Washington, DC 20005  
Ph: 202-737-0202  
Fax: 202-638-4833  
Internet: <http://www.aabchq.com>  
E-mail: [aabchq@aol.com](mailto:aabchq@aol.com)

ASSOCIATION FOR THE ADVANCEMENT OF MEDICAL INSTRUMENTATION (AAMI)  
1110 N. Glebe Rd., Suite 220  
Arlington, VA 22201-5762  
Ph: 1-8001-332-2264 or 703-525-4890  
Fax: 703-276-0793  
Internet: <http://www.aami.org>

ASSOCIATION OF EDISON ILLUMINATING COMPANIES (AEIC)  
600 No. 18th St.  
P.O. Box 2641  
Birmingham, AL 35291  
Ph: 205-257-2530  
Fax: 205-257-2540  
Internet: <http://www.aeic.org>

ASSOCIATION OF HOME APPLIANCE MANUFACTURERS (AHAM)  
1111 19th St. NW., Suite 402  
Washington, DC 20036  
Ph: 202-872-5955  
Fax: 202-872-9354  
Internet: <http://www.aham.org>

BIFMA INTERNATIONAL (BIFMA)  
2680 Horizon Drive SE, Suite A-1  
Grand Rapids, MI 49546-7500  
Ph: 616-285-3963  
Fax: 616-285-3765  
Internet: <http://www.bifma.com>  
E-mail: [email@bifma.com](mailto:email@bifma.com)

BIOCYCLE, JOURNAL OF COMPOSTING AND RECYCLING (BIOCYCLE)  
The JG Press Inc.  
419 State Avenue  
Emmaus PA. 18049  
Ph: 610-967-4135  
Internet: <http://www.biocycle.net>  
E-mail: [jgpress@jgpress.com](mailto:jgpress@jgpress.com)

BRICK INDUSTRY ASSOCIATION (BIA)  
11490 Commerce Park Dr., Suite 308  
Reston, VA 22091-1525  
Ph: 703-620-0010  
Fax: 703-620-3928  
Internet: <http://www.brickinfo.org>

BRITISH STANDARDS INSTITUTE (BSI)  
389 Chiswick High Road  
London W4 4AL  
United Kingdom  
Phone: +44 (0)20 8996 9000  
Fax: +44 (0)20 8996 7400

Email: Info@bsi-global.com  
Website: <http://www.bsi-global.com>

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)  
355 Lexington Ave.  
17th floor  
New York, NY 10017-6603  
Ph: 212-297-2122  
Fax: 212-370-9047  
Internet: <http://www.buildershardware.com>

CARPET AND RUG INSTITUTE (CRI)  
310 Holiday Ave.  
Dalton, GA 30720  
P.O. Box 2048  
Dalton, GA 30722-2048  
Ph: 1-800-882-3176 or 706-278-0232  
Fax: 706-278-8835  
Internet: <http://www.carpet-rug.com>

CAST IRON SOIL PIPE INSTITUTE (CISPI)  
5959 Shallowford Rd., Suite 419  
Chattanooga, TN 37421  
Ph: 423-892-0137  
Fax: 423-892-0817  
Internet: <http://www.cispi.org>

CEILINGS & INTERIOR SYSTEMS CONSTRUCTION ASSOCIATION (CISCA)  
1500 Lincoln Highway, Suite 202  
St. Charles, IL 60174  
Ph: 630-584-1919  
Fax: 630-584-2003  
Internet: <http://www.cisca.org>

CENTERS FOR DISEASE CONTROL AND PREVENTION (CDC)  
  
1600 Clifton Road  
Atlanta, GA 30333  
PH: 404-639-3311  
FAX:  
Internet: <http://www.cdc.gov>

CHEMICAL FABRICS & FILM ASSOCIATION (CFFA)  
  
1300 Sumner Ave.  
Cleveland OH 44115-2851  
PH: 216-241-7333  
FAX: 216-241-0105  
Internet: <http://www.chemicalfabricsandfilm.com/>  
OK 4/02

CHLORINE INSTITUTE (CI)  
2001 L St., NW Suite 506  
Washington, DC 20036  
Ph: 202-775-2790  
Fax: 202-223-7225  
Internet: <http://www.cl2.com>

COMPRESSED AIR AND GAS INSTITUTE (CAGI)

1300 Sumner Ave.  
Cleveland OH 44115-2851  
PH: 216-241-7333  
FAX: 216-241-0105  
Internet: <http://www.cagi.org/>

COMPRESSED GAS ASSOCIATION (CGA)  
4221 Walney Road, 5th Floor  
Chantilly, VA 20151-2923  
Ph: 703-788-2700  
Fax: 703-961-1831  
Internet: <http://www.cganet.com>  
e-mail: [Customer\\_Service@cganet.com](mailto:Customer_Service@cganet.com)

CONCRETE REINFORCING STEEL INSTITUTE (CRSI)  
933 N. Plum Grove Rd.  
Schaumburg, IL 60173-4758  
Ph: 847-517-1200  
Fax: 847-517-1206  
Internet: <http://www.crsi.org/>

CONSUMER PRODUCT SAFETY COMMISSION (CPSC)  
4330 East-West Highway  
Bethesda, Maryland 20814-4408  
Ph: 301-504-0990  
Fx: 301-504-0124 and 301-504-0025  
Internet: <http://www.cpsc.gov>

CONVEYOR EQUIPMENT MANUFACTURERS ASSOCIATION (CEMA)  
6724 Lone Oak Blvd.  
Naples, Florida 34109  
Ph: 941-514-3441  
Fax: 941-514-3470  
Internet: <http://www.cemanet.org>

COOLING TECHNOLOGY INSTITUTE (CTI)  
2611 FM 1960 West  
Suite H-200  
Houston, TX 77068-3730  
Ph: 281-583-4087  
Fax: 281-537-1721  
Internet: <http://www.cti.org>

COPPER DEVELOPMENT ASSOCIATION (CDA)  
260 Madison Ave.  
New York, NY 10016  
Ph: 212-251-7200  
Fax: 212-251-7234  
Internet: <http://www.copper.org>  
E-mail: [staff@cda.copper.org](mailto:staff@cda.copper.org)

CRANE MANUFACTURERS ASSOCIATION OF AMERICA (CMAA)  
8720 Red Oak Blvd., Ste, 201  
Charlotte, NC 28217 USA  
Ph: 704-676-1190 or 800-722-6832  
Fx: 704-676-1199  
Internet: [http://www.mhia.org/psc/psc\\_products\\_cranes.cfm](http://www.mhia.org/psc/psc_products_cranes.cfm)

DISTRICT OF COLUMBIA MUNICIPAL REGULATIONS (DCMR)

441 4th Street NW  
Washington DC 20001  
PH: 202-727-1000  
Internet: <http://www.abfa.com/dcdocs/dcmrlist.htm>

DOOR AND ACCESS SYSTEM MANUFACTURERS ASSOCIATION (DASMA)  
1300 Sumner Avenue  
Cleveland, OH 44115-2851  
Ph: 216-241-7333  
Fax: 216-241-0105  
Internet: <http://www.dasma.com>  
e-mail: [dasma@dasma.com](mailto:dasma@dasma.com)

DOOR AND HARDWARE INSTITUTE (DHI)  
14150 Newbrook Dr. Suite 200  
Chantilly, VA 20151-2223  
Ph: 703-222-2010  
Fax: 703-222-2410  
Internet: <http://www.dhi.org>  
e-mail: [techdept@dhi.org](mailto:techdept@dhi.org)

DUCTILE IRON PIPE RESEARCH ASSOCIATION (DIPRA)  
245 Riverchase Parkway East, Suite 0  
Birmingham, AL 35244  
Ph: 205-402-8700  
Fax: 205-402-8730  
Internet: <http://www.dipra.org>  
E-mail: [info@dipra.org](mailto:info@dipra.org)

EIFS INDUSTRY MEMBERS ASSOCIATION (EIMA)  
3000 Corporate Center Drive, Suite 270  
Morrow, GA 30260  
Ph: 800-294-3462  
Fax: 770-968-5818  
Internet: <http://www.eima.com>

ELECTRICAL GENERATING SYSTEMS ASSOCIATION (EGSA)  
1650 South Dixie Highway, Ste. 500  
Boca Raton, FL 33432  
Ph: 561-750-5575  
Fax: 561-395-8557  
Internet: <http://www.egsa.org>

ELECTRONIC INDUSTRIES ALLIANCE (EIA)  
2500 Wilson Blvd.  
Arlington, VA 22201-3834  
Ph: 703-907-7500  
Fax: 703-907-7501  
Internet: <http://www.eia.org>

ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION (ERDA)  
Organization abolished by Dept of Energy Act  
(91 Stat 577) 4 Aug 1977  
Successor Organization is Department of Energy  
PH:  
FAX:

Internet: <http://www.mbe.doe.gov/>

ENGINE MANUFACTURERS ASSOCIATION (EMA)

Two North LaSalle Street, Suite 2200  
Chicago, IL 60602  
PH: 312-827-8700  
FAX: 312-827-8737  
Internet: <http://www.engine-manufacturers.org/>

ETL TESTING LABORATORIES (ETL)  
Intertek Testing Services, ETL SEMKO  
70 Codman Hill Road  
Boxborough, MA 01719  
PH: 1-800-967-5352  
FAX: 1-800-813-9442  
Internet: <http://www.etlsemko.com>  
E-mail: [info@etlsemko.com](mailto:info@etlsemko.com)

EUROPEAN COMMITTEE FOR ELECTROTECHNICAL STANDARDIZATION (CENELEC)  
CENELEC CS Info & Publications Department  
Rue de Stassartstraat 35  
1050 Brussels  
Phone: + 32 2 519 68 71  
Fax: + 32 2 519 69 19  
Internet: <http://www.cenelec.org>

EXPANSION JOINT MANUFACTURERS ASSOCIATION (EJMA)  
25 N Broadway  
Tarrytown, NY 10591  
Ph: 914-332-0040  
Fax: 914-332-1541  
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Ph: (Toll-Free): 877-364-6726  
Fax: 781-255-0181  
Internet: <http://www.fmglobal.com>

FLUID SEALING ASSOCIATION (FSA)  
994 Old Eagle School Road #1019  
Wayne, PA 19087  
PH: 610-971-4850  
FAX: 610-9971-4859  
Internet: <http://www.fluidsealing.com>  
E-mail: [info@fluidsealing.com](mailto:info@fluidsealing.com)

FORESTRY SUPPLIERS (FSUP)  
205 West Rankin St.  
P.O. Box 8397  
Jackson, MS 39284-8397  
Ph: 601-354-3565  
Fax: 601-292-0165  
Internet: <http://www.forestry-suppliers.com>

FOUNDATION FOR CROSS-CONNECTION CONTROL AND HYDRAULIC RESEARCH  
(FCCCHR)  
University of South California  
Kaprielian Hall 200  
Los Angeles, CA 90089-2531  
Ph: 213-740-2032  
Fax: 213-740-8399  
Internet: <http://www.usc.edu/dept/fccchr>

GEOLOGICAL SOCIETY OF AMERICA (GSA)  
P.O. Box 9140  
Boulder, CO 80301-9140  
Ph: 800-443-4472  
Fax: 303-357-1070  
Internet: <http://www.geosociety.org>

GEOSYNTHETIC INSTITUTE (GSI)  
475 Kedron Ave.  
Folsom, PA 19033-1208  
Ph: 610-522-8440  
Fax: 610-522-8441  
Internet: <http://www.geosynthetic-institute.org>

GLASS ASSOCIATION OF NORTH AMERICA (GANA)  
2945 SW Wanamaker Drive, Suite A  
Topeka, KS 66614-5321  
Ph: 785-271-0208  
Fax: 785-271-0166  
Internet: <http://www.glasswebsite.com/GANA>

GYPSUM ASSOCIATION (GA)  
810 First St. NE, Suite 510  
Washington, DC 20002  
Ph: 202-289-5440  
Fax: 202-289-3707  
Internet: <http://www.gypsum.org>

HARDWOOD PLYWOOD & VENEER ASSOCIATION (HPVA)  
1825 Michael Faraday Dr.  
P.O. Box 2789  
Reston, VA 20195-0789  
Ph: 703-435-2900  
Fax: 703-435-2537  
Internet: <http://www.hpva.org>

HEAT EXCHANGE INSTITUTE (HEI)  
1300 Sumner Ave  
Cleveland, OH 44115-2851  
Ph: 216-241-7333  
Fax: 216-241-0105  
Internet: <http://www.heatexchange.org>  
email: [hei@heatexchange.org](mailto:hei@heatexchange.org)

HOIST MANUFACTURERS INSTITUTE (HMI)  
8720 Red Oak Blvd., Suite 201  
Charlotte, NC 28217  
PH: 704-676-1190  
FAX: 704-676-1199



Internet: [http://www.mhia.org/psc/PSC\\_Products\\_Hoists.cfm](http://www.mhia.org/psc/PSC_Products_Hoists.cfm)

HOLLOW METAL MANUFACTURERS ASSOCIATION (HMMMA)

NAAMM Headquarters  
8 South Michigan Avenue, Suite 1000  
Chicago, IL 60603  
PH: 312-332-0405  
FAX: 312-332-0706  
Internet: <http://www.naamm.org/hmma.htm>

NOTE --- HMMMA has merged with NAAAM.

H.P. WHITE LABORATORY (HPW)  
3114 Scarboro Rd.  
Street, MD 21154  
Ph: 410-838-6550  
fax: 410-838-2802  
Internet: <http://www.hpwhite.com>

HYDRAULIC INSTITUTE (HI)  
9 Sylvan Way, Suite 180  
Parsippany, NJ 07054-3802  
Ph: 888-786-7744 or 973-267-9700  
Fax: 973-267-9055  
Internet: <http://www.pumps.org>

HYDRONICS INSTITUTE DIVISION OF GAMA (HYI)  
35 Russo Pl.  
P.O. Box 218  
Berkeley Heights, NJ 07922-0218  
Ph: 908-464-8200  
Fax: 908-464-7818  
Internet: <http://www.gamanet.org/publist/hydroordr.htm>

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120 Wall St., 17th Floor  
New York, NY 10005-4001  
Ph: 212-248-5000  
Fax: 212-248-5017  
Internet: <http://www.iesna.org>

INDUSTRIAL FASTENERS INSTITUTE (IFI)  
1717 East 9th St., Suite 1105  
Cleveland, OH 44114-2879  
Ph: 216-241-1482  
Fax: 216-241-5901  
Internet: <http://www.industrial-fasteners.org>  
e-mail: [indfast@aol.com](mailto:indfast@aol.com)

INSECT SCREENING WEAVERS ASSOCIATION (ISWA)

DEFUNCT in 1997

INSTITUTE OF CLEAN AIR COMPANIES (ICAC)  
1660 L St., NW, Suite 1100  
Washington, DC 20036-5603  
Ph: 202-457-0911  
Fax: 202-331-1388  
E-mail: [jsmith@icac.com](mailto:jsmith@icac.com)  
Internet: <http://icac.com>

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)  
445 Hoes Ln, P. O. Box 1331  
Piscataway, NJ 08855-1331  
Ph: 732-981-0060 OR 800-701-4333  
Fax: 732-981-9667  
Internet: <http://www.ieee.org>  
E-mail: [customer.services@ieee.org](mailto:customer.services@ieee.org)

INSTITUTE OF ENVIRONMENTAL SCIENCES AND TECHNOLOGY (IEST)  
940 East Northwest Highway  
Mount Prospect, IL 60056  
Ph: 847-255-1561  
Fax: 847-255-1699  
Internet: <http://www.iest.org>

INSULATED CABLE ENGINEERS ASSOCIATION (ICEA)  
P.O. Box 1568  
Carrollton, GA 30117  
Ph: 770-830-0369  
Fax: 770-830-8501  
E-mail:  
Internet: <http://www.icea.net>

INTERNATIONAL APPROVAL SERVICES (IAS)  
8501 East Pleasant Valley Rd.  
Cleveland, OH 44131  
Ph: 216-524-4990  
Fax: 216-328-8118  
Internet: <http://www.csa-international.org>

INTERNATIONAL ASSOCIATION OF PLUMBING AND MECHANICAL OFFICIALS  
(IAPMO)  
20001 East Walnut Dr., So.  
Walnut, CA 91789-2825  
Ph: 909-595-8449  
Fax: 909-594-3690  
Fax for Stds: 909-594-5265  
Internet: <http://www.iapmo.org>

INTERNATIONAL CODE COUNCIL (ICC)  
5203 Leesburg Pike, Suite 600  
Falls Church, VA 22041  
Ph: 703-931-4533  
Fax: 703-379-1546  
Internet: <http://www.intlcode.org>

INTERNATIONAL CONCRETE REPAIR INSTITUTE (ICRI)  
  
3166 S. River Road, Suite 132

Des Plaines, IL 60018  
Phone: 847-827-0830  
Fax: 847-827-0832  
Internet: <http://www.icri.org>

INTERNATIONAL CONFERENCE OF BUILDING OFFICIALS (ICBO)  
5360 Workman Mill Rd.  
Whittier, CA 90601-2298  
Ph: 800-284-4406  
Ph: 562-699-0541  
Fax: 562-692-3853  
Internet: <http://www.icbo.org>

INTERNATIONAL ELECTRICAL TESTING ASSOCIATION (NETA)

P.O. Box 687  
106 Stone Street  
Morrison, Colorado 80465  
PH: 303-697-8441  
FAX: 303-697-8431  
Internet: <http://www.netaworld.org>

INTERNATIONAL ELECTROTECHNICAL COMMISSION (IEC)  
3, rue de Varembe, P.O. Box 131  
CH-1211 Geneva 20, Switzerland  
Ph: 41-22-919-0211  
Fax: 41-22-919-0300  
Internet: <http://www.iec.ch>  
e-mail: [info@iec.ch](mailto:info@iec.ch)

INTERNATIONAL GROUND SOURCE HEAT PUMP ASSOCIATION (IGSHPA)

Oklahoma State University  
490 Cordell South  
Stillwater OK 74078-8018  
PH: 800-626-4747  
FAX: 405-744-5283  
Internet: <http://www.igshpa.okstate.edu/>

INTERNATIONAL INSTITUTE OF AMMONIA REFRIGERATION (IIAR)  
1110 N. Glebe Rd., Suite 250  
Arlington, VA 22201  
Ph: 703-312-4200  
Fax: 703-312-0065  
Internet: <http://www.iiar.org>  
e-mail: [iiar@iiar.org](mailto:iiar@iiar.org)

INTERNATIONAL MUNICIPAL SIGNAL ASSOCIATION (IMSA)  
P.O. Box 539  
165 East Union St.  
Newark, NY 14513-0539  
Ph: 315-331-2182  
Ph: 800-723-4672  
Fax: 315-331-8205  
Internet: <http://www.imsasafety.org/>

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)  
1, rue de Varembe'  
Case Postale 56

CH-1211 Geneve 20 Switzerland  
Ph: 41-22-749-0111  
Fax: 41-22-733-3430  
Internet: <http://www.iso.ch>  
e-mail: [central@iso.ch](mailto:central@iso.ch)

INTERNATIONAL SLURRY SURFACING ASSOCIATION (ISSA)  
3 Church Circle, PMB 250  
Annapolis, MD 21401  
Ph: 410-267-0023  
Fax: 410-267-7546  
Internet: <http://www.slurry.org>  
e-mail: [krissoff@slurry.org](mailto:krissoff@slurry.org)

INTERNATIONAL TELECOMMUNICATION UNION (ITU)  
Order from:  
U.S. Dept of Commerce  
National Technical Information Service  
5285 Port Royal Road.  
Springfield, VA 22161  
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FAX: 703-605-6887  
Internet: <http://www.ntis.gov>

For documents not avail from Dept of Commerce:  
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CH-1211 Geneve 20  
Switzerland  
E-Mail: [sales@itu.ch](mailto:sales@itu.ch)  
Ph: 41.22.730.6141  
Fax: 41.22.730.5194  
Internet: <http://www.itu.org>

IPC - ASSOCIATION CONNECTING ELECTRONICS INDUSTRIES (IPC)  
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Ph: 847-509-9700  
Fax: 847-509-9798  
Internet: <http://www.ipc.org>  
e-mail: [orderipc@ipc.org](mailto:orderipc@ipc.org)

IRON & STEEL SOCIETY (ISS)  
186 Thorn Hill Road  
Warrendale, PA 15086-7528  
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Fax: 724-776-0430  
E-Mail: [dennisf@iss.org](mailto:dennisf@iss.org)  
Internet: <http://www.issource.org>

ISA - THE INSTRUMENTATION, SYSTEMS AND AUTOMATION SOCIETY (ISA)  
67 Alexander Drive  
P.O. Box 12277  
Research Triangle Park, NC 27709  
Ph: 919-549-8411  
Fax: 919-549-8288  
e-mail: [info@isa.org](mailto:info@isa.org)  
Internet: <http://www.isa.org>

KITCHEN CABINET MANUFACTURERS ASSOCIATION (KCMA)  
1899 Preston White Dr.  
Reston, VA 20191-5435  
Ph: 703-264-1690  
Fax: 703-620-6530  
Internet: <http://www.kcma.org>

L.H. BAILEY HORTORIUM (LHBH)

c/o Cornell University  
Information and Referral Center  
Day Hall Lobby  
Ithaca, NY 14853-2801  
PH: 607-254-INFO (4636)  
Internet: <http://www.plantbio.cornell.edu/Hortorium>

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS  
INDUSTRY (MSS)  
127 Park St., NE  
Vienna, VA 22180-4602  
Ph: 703-281-6613  
Fax: 703-281-6671  
Internet: <http://www.mss-hq.com>  
e-mail: [info@mss-hq.com](mailto:info@mss-hq.com)

MAPLE FLOORING MANUFACTURERS ASSOCIATION (MFMA)  
60 Revere Dr., Suite 500  
Northbrook, IL 60062  
Ph: 847-480-9138  
Fax: 847-480-9282  
Internet: <http://www.maplefloor.org>

MARBLE INSTITUTE OF AMERICA (MIA)  
30 Eden Alley, Suite 301  
Columbus, OH 43215  
Ph: 614-228-6194  
Fax: 614-461-1497  
Internet: <http://www.marble-institute.com>  
e-mail: [info@marble-institute.com](mailto:info@marble-institute.com)

MASTER PAINTERS INSTITUTE (MPI)  
4090 Graveley Street  
Burnaby, BC CANADA V5C 3T6  
PH: 888-674-8937  
Fx: 888-211-8708  
Internet: <http://www.paintinfo.com/mpi>

METAL BUILDING MANUFACTURERS ASSOCIATION (MBMA)  
1300 Sumner Ave.  
Cleveland, OH 44115-2851  
Ph: 216-241-7333  
Fax: 216-241-0105  
Internet: <http://www.mbma.com>  
e-mail: [mbma@mbma.com](mailto:mbma@mbma.com)

METAL LATH/STEEL FRAMING ASSOCIATION (ML/SFA)

NAAMM Headquarters

8 South Michigan Avenue, Suite 1000  
Chicago, IL 60603  
PH: 312-332-0405  
FAX: 312-332-0706  
Internet: <http://www.naamm.org/mlsfa.htm>

NOTE --- ML/SFA has merged with NAAMM.

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Omaha, NE 68144  
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Fax: 402-330-9702  
Internet: <http://www.micainsulation.org>  
e-mail: [info@micainsulation.org](mailto:info@micainsulation.org)

MONORAIL MANUFACTURERS ASSOCIATION (MMA)

8720 Red Oak Blvd., Suite 201  
Charlotte, NC 28217  
PH: 704-676-1190  
FAX: 704-676-1199  
Internet: <http://www.mhia.org/>

NACE INTERNATIONAL (NACE)  
1440 South Creek Drive  
Houston, TX 77084-4906  
Ph: 281-228-6200  
Fax: 281-228-6300  
Internet: <http://www.nace.org>

NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)  
8 S. Michigan Ave, Suite 1000  
Chicago, IL 60603  
Ph: 312-322-0405  
Fax: 312-332-0706  
Internet: <http://www.naamm.org>  
e-mail: [naamm@gss.net](mailto:naamm@gss.net)

NATIONAL BOARD OF BOILER AND PRESSURE VESSEL INSPECTORS (NBBPVI)  
1055 Crupper Ave.  
Columbus, OH 43229-1183  
Ph: 614-888-8320  
Fax: 614-847-1147  
Internet: <http://www.nationalboard.org>  
e-mail: [tbecker@nationalboard.org](mailto:tbecker@nationalboard.org)

NATIONAL CABLE TELEVISION ASSOCIATION (NCTA)  
Now: National Cable Telecommunications Association  
1724 Massachusetts Ave. NW  
Washington, DC 20036-1969  
Ph: 202-775-3550  
Fax: 202-775-1055  
Internet: <http://www.ncta.com>

NATIONAL CONCRETE MASONRY ASSOCIATION (NCMA)  
13750 Sunrise Valley Drive  
Herndon, VA 20171  
Ph: 703-713-1900  
Fax: 703-713-1910

Internet: <http://www.ncma.org>

NATIONAL COUNCIL ON RADIATION PROTECTION AND MEASUREMENTS (NCRP)  
7910 Woodmont Ave., Suite 800  
Bethesda, MD 20814-3095  
Ph: 800-229-2652  
Ph. 301-657-2652  
Fax: 301-907-8768  
Internet: <http://www.ncrp.com>

NATIONAL DRILLING ASSOCIATION (NDA)

10901D Roosevelt Boulevard North, Suite 100  
St. Petersburg, FL 33716  
Ph: 727-577-5006  
FAX: 727-577-5012  
Internet: <http://www.nda4u.com/>  
E-mail: [info@nda4u.com](mailto:info@nda4u.com)

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)  
1300 N. 17th St., Suite 1847  
Rosslyn, VA 22209  
Ph: 703-841-3200  
Fax: 703-841-3300  
Internet: <http://www.nema.org/>  
E-mail: [jas\\_peak@nema.org](mailto:jas_peak@nema.org)

NATIONAL ENVIRONMENTAL BALANCING BUREAU (NEBB)  
8575 Grovemont Circle  
Gaithersburg, MD 20877-4121  
Ph: 301-977-3698  
Fax: 301-977-9589  
Internet: <http://www.nebb.org>

NATIONAL FENESTRATION RATING COUNCIL (NFRC)  
1300 Spring Street, Suite 500  
Silver Spring, MD 20910  
Ph: 301-589-6372  
Fax: 303-588-6342  
Internet: <http://www.nfrc.org>  
E-Mail: [nfrcusa@aol.com](mailto:nfrcusa@aol.com) or [info@nfrc.com](mailto:info@nfrc.com)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)  
1 Batterymarch Park  
P.O. Box 9101  
Quincy, MA 02269-9101  
Ph: 617-770-3000  
Fax: 617-770-0700  
Internet: <http://www.nfpa.org>

NATIONAL FLUID POWER ASSOCIATION (NFLPA)  
3333 N. Mayfair Rd.  
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WATER ENVIRONMENT FEDERATION (WEF)  
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Alexandria, VA 22314-1994  
Ph: 703-684-2452  
Fax: 703-684-2492  
Internet: <http://www.wef.org>

WATER QUALITY ASSOCIATION (WQA)  
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Internet: <http://www.wqa.org>  
e-mail: [info@mail.wqa.org](mailto:info@mail.wqa.org)

WEST COAST LUMBER INSPECTION BUREAU (WCLIB)  
P.O. Box 23145  
Portland, OR 97281  
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Fax: 503-684-8928  
Internet: <http://www.wclib.org>  
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Fax: 360-693-9967  
Internet: <http://www.wwpinstitute.org>  
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Internet: <http://www.wwpa.org>  
e-mail: [info@wwpa.org](mailto:info@wwpa.org)

WINDOW AND DOOR MANUFACTURERS ASSOCIATION (WDMA)  
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Des Plaines, IL 60018  
Ph: 847-299-5200 or 800-223-2301  
Fax: 708-299-1286  
Internet: <http://www.wdma.com>  
e-mail: [admin@wdma.com](mailto:admin@wdma.com)

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**04/97**

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SECTION 01451

CONTRACTOR QUALITY CONTROL

04/97

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 3740	(1996) Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
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ASTM E 329	(1995b) Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction
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1.2 PAYMENT

Separate payment will not be made for providing and maintaining an effective Quality Control program, and all costs associated therewith shall be included in the applicable unit prices or lump-sum prices contained in the Bidding Schedule.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 GENERAL

The Contractor is responsible for quality control and shall establish and maintain an effective quality control system in compliance with the Contract Clause titled "Inspection of Construction." The quality control system shall consist of plans, procedures, and organization necessary to produce an end product which complies with the contract requirements. The system shall cover all construction operations, both onsite and offsite, and shall be keyed to the proposed construction sequence. The project superintendent will be held responsible for the quality of work on the job and is subject to removal by the Contracting Officer for non-compliance with quality requirements specified in the contract. The project superintendent in this context shall mean the individual with the responsibility for the overall management of the project including quality and production.

3.2 QUALITY CONTROL PLAN

3.2.1 General

The Contractor shall furnish for review by the Government, not later than 14 days after receipt of notice to proceed, the Contractor Quality Control (CQC) Plan proposed to implement the requirements of the Contract Clause



titled "Inspection of Construction." The plan shall identify personnel, procedures, control, instructions, test, records, and forms to be used. The Government will consider an interim plan for the first 60 days of operation. Construction will be permitted to begin only after acceptance of the CQC Plan or acceptance of an interim plan applicable to the particular feature of work to be started. Work outside of the features of work included in an accepted interim plan will not be permitted to begin until acceptance of a CQC Plan or another interim plan containing the additional features of work to be started.

### 3.2.2 Content of the CQC Plan

The CQC Plan shall include, as a minimum, the following to cover all construction operations, both onsite and offsite, including work by subcontractors, fabricators, suppliers, and purchasing agents:

- a. A description of the quality control organization, including a chart showing lines of authority and acknowledgment that the CQC staff shall implement the three phase control system for all aspects of the work specified. The staff shall include a CQC System Manager who shall report to the project superintendent.
- b. The name, qualifications (in resume format), duties, responsibilities, and authorities of each person assigned a CQC function.
- c. A copy of the letter to the CQC System Manager signed by an authorized official of the firm which describes the responsibilities and delegates sufficient authorities to adequately perform the functions of the CQC System Manager, including authority to stop work which is not in compliance with the contract. The CQC System Manager shall issue letters of direction to all other various quality control representatives outlining duties, authorities, and responsibilities. Copies of these letters shall also be furnished to the Government.
- d. Procedures for scheduling, reviewing, certifying, and managing submittals, including those of subcontractors, offsite fabricators, suppliers, and purchasing agents. These procedures shall be in accordance with Section 01330 SUBMITTAL PROCEDURES.
- e. Control, verification, and acceptance testing procedures for each specific test to include the test name, specification paragraph requiring test, feature of work to be tested, test frequency, and person responsible for each test. (Laboratory facilities will be approved by the Contracting Officer.)
- f. Procedures for tracking preparatory, initial, and follow-up control phases and control, verification, and acceptance tests including documentation.
- g. Procedures for tracking construction deficiencies from identification through acceptable corrective action. These procedures shall establish verification that identified deficiencies have been corrected.
- h. Reporting procedures, including proposed reporting formats.
- i. A list of the definable features of work. A definable feature of

work is a task which is separate and distinct from other tasks, has separate control requirements, and may be identified by different trades or disciplines, or it may be work by the same trade in a different environment. Although each section of the specifications may generally be considered as a definable feature of work, there are frequently more than one definable features under a particular section. This list will be agreed upon during the coordination meeting.

### 3.2.3 Acceptance of Plan

Acceptance of the Contractor's plan is required prior to the start of construction. Acceptance is conditional and will be predicated on satisfactory performance during the construction. The Government reserves the right to require the Contractor to make changes in his CQC Plan and operations including removal of personnel, as necessary, to obtain the quality specified.

### 3.2.4 Notification of Changes

After acceptance of the CQC Plan, the Contractor shall notify the Contracting Officer in writing of any proposed change. Proposed changes are subject to acceptance by the Contracting Officer.

## 3.3 COORDINATION MEETING

After the Preconstruction Conference, before start of construction, and prior to acceptance by the Government of the CQC Plan, the Contractor shall meet with the Contracting Officer or Authorized Representative and discuss the Contractor's quality control system. The CQC Plan shall be submitted for review a minimum of 7 calendar days prior to the Coordination Meeting. During the meeting, a mutual understanding of the system details shall be developed, including the forms for recording the CQC operations, control activities, testing, administration of the system for both onsite and offsite work, and the interrelationship of Contractor's Management and control with the Government's Quality Assurance. Minutes of the meeting shall be prepared by the Government and signed by both the Contractor and the Contracting Officer. The minutes shall become a part of the contract file. There may be occasions when subsequent conferences will be called by either party to reconfirm mutual understandings and/or address deficiencies in the CQC system or procedures which may require corrective action by the Contractor.

## 3.4 QUALITY CONTROL ORGANIZATION

### 3.4.1 General

The requirements for the CQC organization are a CQC System Manager and sufficient number of additional qualified personnel to ensure contract compliance. The Contractor shall provide a CQC organization which shall be at the site at all times during progress of the work and with complete authority to take any action necessary to ensure compliance with the contract. All CQC staff members shall be subject to acceptance by the Contracting Officer.

### 3.4.2 CQC System Manager

The Contractor shall identify as CQC System Manager an individual within the onsite work organization who shall be responsible for overall

management of CQC and have the authority to act in all CQC matters for the Contractor. The CQC System Manager shall be a graduate engineer, graduate architect, or a graduate of construction management, with a minimum of 10 years construction experience on construction similar to this contract. This CQC System Manager shall be on the site at all times during construction and shall be employed by the prime Contractor. The CQC System Manager shall be assigned no other duties. An alternate for the CQC System Manager shall be identified in the plan to serve in the event of the System Manager's absence. The requirements for the alternate shall be the same as for the designated CQC System Manager.

### 3.5 SUBMITTALS

Submittals shall be made as specified in Section 01330 SUBMITTAL PROCEDURES. The CQC organization shall be responsible for certifying that all submittals are in compliance with the contract requirements.

### 3.6 CONTROL

Contractor Quality Control is the means by which the Contractor ensures that the construction, to include that of subcontractors and suppliers, complies with the requirements of the contract. At least three phases of control shall be conducted by the CQC System Manager for each definable feature of work as follows:

#### 3.6.1 Preparatory Phase

This phase shall be performed prior to beginning work on each definable feature of work, after all required plans/documents/materials are approved/accepted, and after copies are at the work site. This phase shall include:

- a. A review of each paragraph of applicable specifications.
- b. A review of the contract drawings.
- c. A check to assure that all materials and/or equipment have been tested, submitted, and approved.
- d. Review of provisions that have been made to provide required control inspection and testing.
- e. Examination of the work area to assure that all required preliminary work has been completed and is in compliance with the contract.
- f. A physical examination of required materials, equipment, and sample work to assure that they are on hand, conform to approved shop drawings or submitted data, and are properly stored.
- g. A review of the appropriate activity hazard analysis to assure safety requirements are met.
- h. Discussion of procedures for controlling quality of the work including repetitive deficiencies. Document construction tolerances and workmanship standards for that feature of work.
- i. A check to ensure that the portion of the plan for the work to be performed has been accepted by the Contracting Officer.

- j. Discussion of the initial control phase.
- k. The Government shall be notified at least 24 hours in advance of beginning the preparatory control phase. This phase shall include a meeting conducted by the CQC System Manager and attended by the superintendent, other CQC personnel (as applicable), and the foreman responsible for the definable feature. The results of the preparatory phase actions shall be documented by separate minutes prepared by the CQC System Manager and attached to the daily CQC report. The Contractor shall instruct applicable workers as to the acceptable level of workmanship required in order to meet contract specifications.

### 3.6.2 Initial Phase

This phase shall be accomplished at the beginning of a definable feature of work. The following shall be accomplished:

- a. A check of work to ensure that it is in full compliance with contract requirements. Review minutes of the preparatory meeting.
- b. Verify adequacy of controls to ensure full contract compliance. Verify required control inspection and testing.
- c. Establish level of workmanship and verify that it meets minimum acceptable workmanship standards. Compare with required sample panels as appropriate.
- d. Resolve all differences.
- e. Check safety to include compliance with and upgrading of the safety plan and activity hazard analysis. Review the activity analysis with each worker.
- f. The Government shall be notified at least 24 hours in advance of beginning the initial phase. Separate minutes of this phase shall be prepared by the CQC System Manager and attached to the daily CQC report. Exact location of initial phase shall be indicated for future reference and comparison with follow-up phases.
- g. The initial phase should be repeated for each new crew to work onsite, or any time acceptable specified quality standards are not being met.

### 3.6.3 Follow-up Phase

Daily checks shall be performed to assure control activities, including control testing, are providing continued compliance with contract requirements, until completion of the particular feature of work. The checks shall be made a matter of record in the CQC documentation. Final follow-up checks shall be conducted and all deficiencies corrected prior to the start of additional features of work which may be affected by the deficient work. The Contractor shall not build upon nor conceal non-conforming work.

### 3.6.4 Additional Preparatory and Initial Phases

Additional preparatory and initial phases shall be conducted on the same

definable features of work if the quality of on-going work is unacceptable, if there are changes in the applicable CQC staff, onsite production supervision or work crew, if work on a definable feature is resumed after a substantial period of inactivity, or if other problems develop.

### 3.7 TESTS

#### 3.7.1 Testing Procedure

The Contractor shall perform specified or required tests to verify that control measures are adequate to provide a product which conforms to contract requirements. Upon request, the Contractor shall furnish to the Government duplicate samples of test specimens for possible testing by the Government. Testing includes operation and/or acceptance tests when specified. The Contractor shall procure the services of a Corps of Engineers approved testing laboratory or establish an approved testing laboratory at the project site. The Contractor shall perform the following activities and record and provide the following data:

- a. Verify that testing procedures comply with contract requirements.
- b. Verify that facilities and testing equipment are available and comply with testing standards.
- c. Check test instrument calibration data against certified standards.
- d. Verify that recording forms and test identification control number system, including all of the test documentation requirements, have been prepared.
- e. Results of all tests taken, both passing and failing tests, shall be recorded on the CQC report for the date taken. Specification paragraph reference, location where tests were taken, and the sequential control number identifying the test shall be given. If approved by the Contracting Officer, actual test reports may be submitted later with a reference to the test number and date taken. An information copy of tests performed by an offsite or commercial test facility shall be provided directly to the Contracting Officer. Failure to submit timely test reports as stated may result in nonpayment for related work performed and disapproval of the test facility for this contract.

#### 3.7.2 Testing Laboratories

##### 3.7.2.1 Capability Check

The Government reserves the right to check laboratory equipment in the proposed laboratory for compliance with the standards set forth in the contract specifications and to check the laboratory technician's testing procedures and techniques. Laboratories utilized for testing soils, concrete, asphalt, and steel shall meet criteria detailed in ASTM D 3740 and ASTM E 329.

##### 3.7.2.2 Capability Recheck

If the selected laboratory fails the capability check, the Contractor will be assessed a charge of \$100.00 to reimburse the Government for each succeeding recheck of the laboratory or the checking of a subsequently selected laboratory. Such costs will be deducted from the contract amount

due the Contractor.

### 3.7.3 Onsite Laboratory

The Government reserves the right to utilize the Contractor's control testing laboratory and equipment to make assurance tests and to check the Contractor's testing procedures, techniques, and test results at no additional cost to the Government.

### 3.7.4 Furnishing or Transportation of Samples for Testing

Costs incidental to the transportation of samples or materials shall be borne by the Contractor. Samples of materials for test verification and acceptance testing by the Government shall be delivered to the Corps of Engineers Division Laboratory, f.o.b..

Coordination for each specific test, exact delivery location, and dates will be made through the Area Office.

## 3.8 COMPLETION INSPECTION

### 3.8.1 Punch-Out Inspection

Near the completion of all work or any increment thereof established by a completion time stated in the Special Clause entitled "Commencement, Prosecution, and Completion of Work," or stated elsewhere in the specifications, the CQC System Manager shall conduct an inspection of the work and develop a punch list of items which do not conform to the approved drawings and specifications. Such a list of deficiencies shall be included in the CQC documentation, as required by paragraph DOCUMENTATION below, and shall include the estimated date by which the deficiencies will be corrected. The CQC System Manager or staff shall make a second inspection to ascertain that all deficiencies have been corrected. Once this is accomplished, the Contractor shall notify the Government that the facility is ready for the Government Pre-Final inspection.

### 3.8.2 Pre-Final Inspection

The Government will perform this inspection to verify that the facility is complete and ready to be occupied. A Government Pre-Final Punch List may be developed as a result of this inspection. The Contractor's CQC System Manager shall ensure that all items on this list have been corrected before notifying the Government so that a Final inspection with the customer can be scheduled. Any items noted on the Pre-Final inspection shall be corrected in a timely manner. These inspections and any deficiency corrections required by this paragraph shall be accomplished within the time slated for completion of the entire work or any particular increment thereof if the project is divided into increments by separate completion dates.

### 3.8.3 Final Acceptance Inspection

The Contractor's Quality Control Inspection personnel, plus the superintendent or other primary management person, and the Contracting Officer's Representative shall be in attendance at this inspection. Additional Government personnel including, but not limited to, those from Base/Post Civil Facility Engineer user groups, and major commands may also be in attendance. The final acceptance inspection will be formally scheduled by the Contracting Officer based upon results of the Pre-Final

inspection. Notice shall be given to the Contracting Officer at least 14 days prior to the final acceptance inspection and shall include the Contractor's assurance that all specific items previously identified to the Contractor as being unacceptable, along with all remaining work performed under the contract, will be complete and acceptable by the date scheduled for the final acceptance inspection. Failure of the Contractor to have all contract work acceptably complete for this inspection will be cause for the Contracting Officer to bill the Contractor for the Government's additional inspection cost in accordance with the contract clause titled "Inspection of Construction".

### 3.9 DOCUMENTATION

The Contractor shall maintain current records providing factual evidence that required quality control activities and/or tests have been performed. These records shall include the work of subcontractors and suppliers and shall be on an acceptable form that includes, as a minimum, the following information:

- a. Contractor/subcontractor and their area of responsibility.
- b. Operating plant/equipment with hours worked, idle, or down for repair.
- c. Work performed each day, giving location, description, and by whom. When Network Analysis (NAS) is used, identify each phase of work performed each day by NAS activity number.
- d. Test and/or control activities performed with results and references to specifications/drawings requirements. The control phase should be identified (Preparatory, Initial, Follow-up). List deficiencies noted along with corrective action.
- e. Quantity of materials received at the site with statement as to acceptability, storage, and reference to specifications/drawings requirements.
- f. Submittals reviewed, with contract reference, by whom, and action taken.
- g. Off-site surveillance activities, including actions taken.
- h. Job safety evaluations stating what was checked, results, and instructions or corrective actions.
- i. Instructions given/received and conflicts in plans and/or specifications.
- j. Contractor's verification statement.

These records shall indicate a description of trades working on the project; the number of personnel working; weather conditions encountered; and any delays encountered. These records shall cover both conforming and deficient features and shall include a statement that equipment and materials incorporated in the work and workmanship comply with the contract. The original and one copy of these records in report form shall be furnished to the Government daily within 24 hours after the date covered by the report, except that reports need not be submitted for days on which no work is performed. As a minimum, one report shall be prepared and

submitted for every 7 days of no work and on the last day of a no work period. All calendar days shall be accounted for throughout the life of the contract. The first report following a day of no work shall be for that day only. Reports shall be signed and dated by the CQC System Manager. The report from the CQC System Manager shall include copies of test reports and copies of reports prepared by all subordinate quality control personnel.

### 3.10 NOTIFICATION OF NONCOMPLIANCE

The Contracting Officer will notify the Contractor of any detected noncompliance with the foregoing requirements. The Contractor shall take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site, shall be deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to such stop orders shall be made the subject of claim for extension of time or for excess costs or damages by the Contractor.

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SECTION 01500

TEMPORARY CONSTRUCTION FACILITIES

02/97

1.1 GENERAL REQUIREMENTS

1.1.1 Site Plan

The Contractor shall prepare a site plan indicating the proposed location and dimensions of any area to be fenced and used by the Contractor, the number of trailers to be used, avenues of ingress/egress to the fenced area and details of the fence installation. This plan shall be submitted to the Government for approval. Any areas which may have to be graveled to prevent the tracking of mud shall also be identified. The Contractor shall also indicate if the use of a supplemental or other staging area is desired.

1.1.2 Identification of Employees

The Contractor shall be responsible for furnishing to each employee, and for requiring each employee engaged on the work to display, identification as approved and directed by the Contracting Officer. Prescribed identification shall immediately be delivered to the Contracting Officer for cancellation upon release of any employee. When required, the Contractor shall obtain and provide fingerprints of persons employed on the project. Contractor and subcontractor personnel shall wear identifying markings on hard hats clearly identifying the company employee's.

1.1.3 Employee Parking

Contractor employees shall park privately owned vehicles in an area designated by the Contracting Officer. This area will be within reasonable walking distance of the construction site. Contractor employee parking shall not interfere with existing and established parking requirements of the military installation.

1.2 AVAILABILITY AND USE OF UTILITY SERVICES

1.2.1 Payment for Utility Services

The Government will make all reasonably required utilities available to the Contractor from existing outlets and supplies, as specified in the contract. Unless otherwise provided in the contract, the amount of each utility service consumed shall be charged to or paid for by the Contractor at prevailing rates charged to the Government or, where the utility is produced by the Government, at reasonable rates determined by the Contracting Officer. The Contractor shall carefully conserve any utilities furnished without charge.

1.2.2 Meters and Temporary Connections

The Contractor, at its expense and in a manner satisfactory to the Contracting Officer, shall provide and maintain necessary temporary connections, distribution lines, meters and meter bases required to measure the amount of each utility used for the purpose of determining charges. The Contractor shall notify the Contracting Officer, in writing, 5 working days before final electrical connection is desired so that a utilities contract can be established. The Contractor will provide a meter and make

the final hot connection after inspection and approval of the Contractor's temporary wiring installation.

#### 1.2.3 Advance Deposit

An advance deposit for utilities consisting of an estimated month's usage or a minimum of \$50.00 will be required. The last monthly bills for the fiscal year will normally be offset by the deposit and adjustments will be billed or returned as appropriate. Services to be rendered for the next fiscal year, beginning 1 October, will require a new deposit. Notification of the due date for this deposit will be mailed to the Contractor prior to the end of the current fiscal year.

#### 1.2.4 Final Meter Reading

Before completion of the work and final acceptance of the work by the Government, the Contractor shall notify the Contracting Officer, in writing, 5 working days before termination is desired. The Government will take a final meter reading. The Contractor shall disconnect service, and remove the meters. The Contractor shall then remove all the temporary distribution lines, meter bases, and associated paraphernalia. The Contractor shall pay all outstanding utility bills before final acceptance of the work by the Government.

#### 1.2.5 Sanitation

The Contractor shall provide and maintain within the construction area minimum field-type sanitary facilities approved by the Contracting Officer. Government toilet facilities will not be available to Contractor's personnel.

#### 1.2.6 Telephone

The Contractor shall make arrangements and pay all costs for telephone facilities desired.

### 1.3 BULLETIN BOARD, PROJECT SIGN, AND PROJECT SAFETY SIGN

#### 1.3.1 Bulletin Board

Immediately upon beginning of work, the Contractor shall provide a weatherproof glass-covered bulletin board not less than 36 by 48 inches in size for displaying the Equal Employment Opportunity poster, a copy of the wage decision contained in the contract, Wage Rate Information poster, and other information approved by the Contracting Officer. The bulletin board shall be located at the project site in a conspicuous place easily accessible to all employees, as approved by the Contracting Officer. Legible copies of the aforementioned data shall be displayed until work is completed. Upon completion of work the bulletin board shall be removed by and remain the property of the Contractor.

#### 1.3.2 Project and Safety Signs

The requirements for the signs, their content, and location shall be as shown on the drawings. The signs shall be erected within 15 days after receipt of the notice to proceed. The data required by the safety sign shall be corrected daily, with light colored metallic or non-metallic numerals. Upon completion of the project, the signs shall be removed from the site.

#### 1.4 PROTECTION AND MAINTENANCE OF TRAFFIC

During construction the Contractor shall provide access and temporary relocated roads as necessary to maintain traffic. The Contractor shall maintain and protect traffic on all affected roads during the construction period except as otherwise specifically directed by the Contracting Officer. Measures for the protection and diversion of traffic, including the provision of watchmen and flagmen, erection of barricades, placing of lights around and in front of equipment and the work, and the erection and maintenance of adequate warning, danger, and direction signs, shall be as required by the State and local authorities having jurisdiction. The traveling public shall be protected from damage to person and property. The Contractor's traffic on roads selected for hauling material to and from the site shall interfere as little as possible with public traffic. The Contractor shall investigate the adequacy of existing roads and the allowable load limit on these roads. The Contractor shall be responsible for the repair of any damage to roads caused by construction operations.

##### 1.4.1 Haul Roads

The Contractor shall, at its own expense, construct access and haul roads necessary for proper prosecution of the work under this contract. Haul roads shall be constructed with suitable grades and widths; sharp curves, blind corners, and dangerous cross traffic shall be avoided. The Contractor shall provide necessary lighting, signs, barricades, and distinctive markings for the safe movement of traffic. The method of dust control, although optional, shall be adequate to ensure safe operation at all times. Location, grade, width, and alignment of construction and hauling roads shall be subject to approval by the Contracting Officer. Lighting shall be adequate to assure full and clear visibility for full width of haul road and work areas during any night work operations. Upon completion of the work, haul roads designated by the Contracting Officer shall be removed.

##### 1.4.2 Barricades

The Contractor shall erect and maintain temporary barricades to limit public access to hazardous areas. Such barricades shall be required whenever safe public access to paved areas such as roads, parking areas or sidewalks is prevented by construction activities or as otherwise necessary to ensure the safety of both pedestrian and vehicular traffic. Barricades shall be securely placed, clearly visible with adequate illumination to provide sufficient visual warning of the hazard during both day and night.

#### 1.5 CONTRACTOR'S TEMPORARY FACILITIES

##### 1.5.1 Administrative Field Offices

The Contractor shall provide and maintain administrative field office facilities within the construction area at the designated site. Government office and warehouse facilities will not be available to the Contractor's personnel.

##### 1.5.2 Storage Area

The Contractor shall construct a temporary 6 foot high chain link fence around trailers and materials. The fence shall include plastic strip inserts, colored green, so that visibility through the fence is obstructed.

Fence posts may be driven, in lieu of concrete bases, where soil conditions permit. Trailers, materials, or equipment shall not be placed or stored outside the fenced area unless such trailers, materials, or equipment are assigned a separate and distinct storage area by the Contracting Officer away from the vicinity of the construction site but within the military boundaries. Trailers, equipment, or materials shall not be open to public view with the exception of those items which are in support of ongoing work on any given day. Materials shall not be stockpiled outside the fence in preparation for the next day's work. Mobile equipment, such as tractors, wheeled lifting equipment, cranes, trucks, and like equipment, shall be parked within the fenced area at the end of each work day.

#### 1.5.3 Supplemental Storage Area

Upon Contractor's request, the Contracting Officer will designate another or supplemental area for the Contractor's use and storage of trailers, equipment, and materials. This area may not be in close proximity of the construction site but shall be within the military boundaries. Fencing of materials or equipment will not be required at this site; however, the Contractor shall be responsible for cleanliness and orderliness of the area used and for the security of any material or equipment stored in this area. Utilities will not be provided to this area by the Government.

#### 1.5.4 Appearance of Trailers

Trailers utilized by the Contractor for administrative or material storage purposes shall present a clean and neat exterior appearance and shall be in a state of good repair. Trailers which, in the opinion of the Contracting Officer, require exterior painting or maintenance will not be allowed on the military property.

#### 1.5.5 Maintenance of Storage Area

Fencing shall be kept in a state of good repair and proper alignment. Should the Contractor elect to traverse, with construction equipment or other vehicles, grassed or unpaved areas which are not established roadways, such areas shall be covered with a layer of gravel as necessary to prevent rutting and the tracking of mud onto paved or established roadways; gravel gradation shall be at the Contractor's discretion. Grass located within the boundaries of the construction site shall be mowed for the duration of the project. Grass and vegetation along fences, buildings, under trailers, and in areas not accessible to mowers shall be edged or trimmed neatly.

#### 1.5.6 Omitted

#### 1.5.7 Security Provisions

Adequate outside security lighting shall be provided at the Contractor's temporary facilities. The Contractor shall be responsible for the security of its own equipment; in addition, the Contractor shall notify the appropriate law enforcement agency requesting periodic security checks of the temporary project field office.

### 1.6 PLANT COMMUNICATION

Whenever the Contractor has the individual elements of its plant so located that operation by normal voice between these elements is not satisfactory,

the Contractor shall install a satisfactory means of communication, such as telephone or other suitable devices. The devices shall be made available for use by Government personnel.

#### 1.7 TEMPORARY PROJECT SAFETY FENCING

As soon as practicable, but not later than 15 days after the date established for commencement of work, the Contractor shall furnish and erect temporary project safety fencing at the work site. The safety fencing shall be a high visibility orange colored, high density polyethylene grid or approved equal, a minimum of 42 inches high, supported and tightly secured to steel posts located on maximum 10 foot centers, constructed at the approved location. The safety fencing shall be maintained by the Contractor during the life of the contract and, upon completion and acceptance of the work, shall become the property of the Contractor and shall be removed from the work site.

#### 1.8 CLEANUP

Construction debris, waste materials, packaging material and the like shall be removed from the work site daily. Any dirt or mud which is tracked onto paved or surfaced roadways shall be cleaned away. Materials resulting from demolition activities which are salvageable shall be stored within the fenced area described above or at the supplemental storage area. Stored material not in trailers, whether new or salvaged, shall be neatly stacked when stored.

#### 1.9 RESTORATION OF STORAGE AREA

Upon completion of the project and after removal of trailers, materials, and equipment from within the fenced area, the fence shall be removed and will become the property of the Contractor. Areas used by the Contractor for the storage of equipment or material, or other use, shall be restored to the original or better condition. Gravel used to traverse grassed areas shall be removed and the area restored to its original condition, including top soil and seeding as necessary.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

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SECTION 01780

CLOSEOUT SUBMITTALS

**11/99**

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SECTION 01780

CLOSEOUT SUBMITTALS

**11/99**

PART 1 GENERAL

1.1 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

As-Built Drawings G

Drawings showing final as-built conditions of the project.

1.2 PROJECT RECORD DOCUMENTS

1.2.1 As-Built Drawings

This paragraph covers as-built drawings complete, as a requirement of the contract. The terms "drawings," "contract drawings," "drawing files," "working as-built drawings" and "final as-built drawings" refer to contract drawings which are revised to be used for final as-built drawings.

1.2.1.1 Government Furnished Materials

One set of electronic CADD files in the specified software and format revised to reflect all bid amendments will be provided by the Government at the preconstruction conference for projects requiring CADD file as-built drawings.

1.2.1.2 Working As-Built and Final As-Built Drawings

The Contractor shall revise 2 sets of paper drawings, along with updated CADD drawings, by red-line process to show the as-built conditions during the prosecution of the project. These working as-built marked drawings shall be kept current on a weekly basis and at least one set shall be available on the jobsite at all times. Changes from the contract plans which are made in the work or additional information which might be uncovered in the course of construction shall be accurately and neatly recorded as they occur by means of details and notes. Final as-built drawings shall be prepared after the completion of each definable feature of work as listed in the Contractor Quality Control Plan (Foundations, Utilities, Structural Steel, etc., as appropriate for the project). The working as-built marked prints and final as-built drawings will be jointly reviewed for accuracy and completeness by the Contracting Officer and the Contractor prior to submission of each monthly pay estimate. If the Contractor fails to maintain the working and final as-built drawings as specified herein, the Contracting Officer will deduct from the monthly progress payment an amount representing the estimated cost of maintaining the as-built drawings. This monthly deduction will continue until an agreement can be reached between the Contracting Officer and the Contractor



regarding the accuracy and completeness of updated drawings. The working and final as-built drawings shall show, but shall not be limited to, the following information:

- a. Fire Alarm System designed by the Contractor.

#### 1.2.1.3 Drawing Preparation

The as-built drawings shall be modified as may be necessary to correctly show the features of the project as it has been constructed by bringing the contract set into agreement with approved working as-built prints, and adding such additional drawings as may be necessary. These working as-built marked prints shall be neat, legible and accurate. These drawings are part of the permanent records of this project and shall be returned to the Contracting Officer after approval by the Government. Any drawings damaged or lost by the Contractor shall be satisfactorily replaced by the Contractor at no expense to the Government.

#### 1.2.1.4 Computer Aided Design and Drafting (CADD) Drawings

Only personnel proficient in the preparation of CADD drawings shall be employed to modify the contract drawings or prepare additional new drawings. Additions and corrections to the contract drawings shall be equal in quality and detail to that of the originals. Line colors, line weights, lettering, layering conventions, and symbols shall be the same as the original line colors, line weights, lettering, layering conventions, and symbols. If additional drawings are required, they shall be prepared using the specified electronic file format applying the same graphic standards specified for original drawings. The title block and drawing border to be used for any new final as-built drawings shall be identical to that used on the contract drawings. Additions and corrections to the contract drawings shall be accomplished using CADD files. The Contractor shall be responsible for providing all program files and hardware necessary to prepare final as-built drawings. The Contracting Officer will review final as-built drawings for accuracy and the Contractor shall make required corrections, changes, additions, and deletions.

- a. CADD colors shall be the "base" colors of red, green, and blue. Color code for changes shall be as follows:

- (1) Deletions (red) - Deleted graphic items (lines) shall be colored red with red lettering in notes and leaders.
- (2) Additions (Green) - Added items shall be drawn in green with green lettering in notes and leaders.
- (3) Special (Blue) - Items requiring special information, coordination, or special detailing or detailing notes shall be in blue.

- b. The Contract Drawing files shall be renamed in a manner related to the contract number (i.e., 98-C-10.DGN) as instructed in the Pre-Construction conference. Marked-up changes shall be made only to those renamed files. All changes shall be made on the layer/level as the original item. There shall be no deletions of existing lines; existing lines shall be over struck in red. Additions shall be in green with line weights the same as the drawing. Special notes shall be in blue on layer #63.

c. When final revisions have been completed, the cover sheet drawing shall show the wording "RECORD DRAWING AS-BUILT" followed by the name of the Contractor in letters at least 3/16 inch high. All other contract drawings shall be marked either "AS-Built" drawing denoting no revisions on the sheet or "Revised As-Built" denoting one or more revisions. Original contract drawings shall be dated in the revision block.

d. Within 10 days after Government approval of all of the working as-built drawings for a phase of work, the Contractor shall prepare the final CADD as-built drawings for that phase of work and submit two sets of blue-lined prints of these drawings for Government review and approval. The Government will promptly return one set of prints annotated with any necessary corrections. Within 7 days the Contractor shall revise the CADD files accordingly at no additional cost and submit one set of final prints for the completed phase of work to the Government. Within 10 days the Contractor shall submit the final as-built drawing package for the entire project. The submittal shall consist of one set of electronic files on compact disc, read-only memory (CD-ROM), one set of mylars, two sets of blue-line prints and one set of the approved working as-built drawings. They shall be complete in all details and identical in form and function to the contract drawing files supplied by the Government. Any transactions or adjustments necessary to accomplish this is the responsibility of the Contractor. The Government reserves the right to reject any drawing files it deems incompatible with the customer's CADD system. Paper prints, drawing files and storage media submitted will become the property of the Government upon final approval. Failure to submit final as-built drawing files and marked prints as specified shall be cause for withholding any payment due the Contractor under this contract. Approval and acceptance of final as-built drawings shall be accomplished before final payment is made to the Contractor.

#### 1.2.1.5 Payment

No separate payment will be made for as-built drawings required under this contract, and all costs accrued in connection with such drawings shall be considered a subsidiary obligation of the Contractor.

#### 1.2.2 Real Property Equipment

The Contractor shall furnish a list of installed equipment furnished under this contract. The list shall include all information usually listed on manufacturer's name plate. The "EQUIPMENT-IN-PLACE LIST" shall include, as applicable, the following for each piece of equipment installed: description of item, location (by room number), model number, serial number, capacity, name and address of manufacturer, name and address of equipment supplier, condition, spare parts list, manufacturer's catalog, and warranty. A draft list shall be furnished at time of transfer. The final list shall be furnished 30 days after transfer of the completed facility.

#### 1.3 OPERATION AND MAINTENANCE MANUALS

Operation manuals and maintenance manuals shall be submitted as specified. Operation manuals and maintenance manuals provided in a common volume shall be clearly differentiated and shall be separately indexed.

#### 1.4 FINAL CLEANING

The premises shall be left broom clean. Stains, foreign substances, and

temporary labels shall be removed from surfaces. Carpet and soft surfaces shall be vacuumed. Equipment and fixtures shall be cleaned to a sanitary condition. Filters of operating equipment shall be replaced. Paved areas shall be swept and landscaped areas shall be raked clean. The site shall have waste, surplus materials, and rubbish removed. The project area shall have temporary structures, barricades, project signs, and construction facilities removed.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

-- End of Section --

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DIVISION 02 - SITE WORK

SECTION 02013

ENVIRONMENT PROTECTION DURING CONSTRUCTION

**04/98**

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SECTION 02013

ENVIRONMENT PROTECTION DURING CONSTRUCTION

04/98

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2. Quality Control
3. Environmental Protection Plan
4. Implementation
5. Subcontractors
6. Notification
7. Protection of Environmental Resources
8. Post-Construction Cleanup
9. Restoration of Landscape Damage
10. Maintenance of Pollution Control Facilities
11. Training in Pollution Control

1. SCOPE: This section covers prevention of environmental pollution and damage to the environment as the result of construction operations under this contract and for those measures set forth in other technical provisions of these specifications. For the purpose of this specification, environmental pollution and damage to the environment is defined as the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to man; or degrade the utility of the environment for aesthetic, cultural, and/or historical purposes. The control of environmental pollution and damage requires consideration of the potential effects of an action upon air, water, and land resources, and includes management of visual aesthetics, natural and cultural resources, noise levels, solid waste, hazardous waste, toxic waste, radiant energy, and radioactive materials, as well as other pollutants.

2. QUALITY CONTROL: The Contractor shall establish and maintain quality control for environmental protection of all items set forth herein. The Contractor shall record on daily reports any problems in complying with laws, regulations, ordinances, and corrective action taken. The Contractor shall immediately inform the Contracting Officer's Representative of any environmental problem.

3. ENVIRONMENTAL PROTECTION PLAN: The Contractor shall submit an Environmental Protection Plan which must be approved by the PWBC Environmental/Natural Resources Division prior to construction. It shall include, but is not limited to, the following:

3.1 Legal Requirements. A list of Federal, State, and local laws, regulations, and permits concerning environmental protection and pollution control and abatement that are applicable to the Contractor's proposed operations and the requirements imposed by those laws, regulations, and permits shall be included. Whenever there is a conflict between Federal, State, or local laws, regulations, and permit requirements, the more restrictive provision shall apply.

3.2 Protection of Features. The Contractor shall prepare a listing of methods to protect resources needing preservation within authorized work

areas. These include natural vegetation such as trees, shrubs, vines, grasses, and ground cover; landscape features; air and water quality; fish and wildlife habitat; endangered species; and soil conservation, as well as historical, archeological, and cultural resources.

3.3 Environmental Protection Procedures. Procedures to be implemented to provide the required environmental protection and to comply with the applicable laws and regulations shall be included. The Contractor shall set out the procedures to be followed to correct pollution of the environment due to accident, natural causes, or failure to follow the procedures set out in accordance with the Environmental Protection Plan.

3.4 Design Drawings. Drawings showing locations of any proposed temporary excavations or embankments for haul roads, stream crossings, material storage areas, temporary fuel tanks, sanitary facilities, and stockpiles of excess or spoil materials shall be included.

3.5 Environmental Monitoring Management Plan. The Environmental Protection Plan shall include plans for monitoring environmental compliance for the jobsite, including land, water, air, noise, hazardous and toxic wastes, and materials and solid waste disposal.

3.6 Protection of Land Resources. Plan of protection for land resources as described in paragraph 7.1 of this specification shall be included.

3.7 Protection of Surface and Groundwater. Methods of protecting surface and groundwater during construction activities as described in paragraph 7.3 of this specification shall be included.

3.8 Protection of Air Resources. Methods for protecting air resources as described in paragraph 7.5 of this specification shall be included.

4. IMPLEMENTATION: The Contractor shall submit, in writing, the Environmental Protection Plan to the Contracting Officer's Representative within 10 days after receipt of Notice to Proceed. The Contracting Officer's Representative shall submit the plan to the PWBC Environmental/Natural Resources Division for approval. Approval of the Contractor's plan will not relieve the Contractor of his responsibility for adequate and continuing control of pollutants and other environmental protection measures.

5. SUBCONTRACTORS: Assurance that subcontractors comply with the environmental protection requirements of this section will be the responsibility of the prime Contractor.

6. NOTIFICATION: The Contracting Officer will notify the Contractor in writing of any observed noncompliance with the aforementioned Federal, State, or local laws or regulations, permits, and other elements of the Contractor's Environmental Protection Plan. The Contractor shall, after receipt of such notice, inform the Contracting Officer of proposed corrective action and implement such action as approved by the PWBC Environmental/Natural Resources Division. If the Contractor fails to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No time extensions shall be granted or costs or damages allowed to the Contractor for any such suspension.

7. PROTECTION OF ENVIRONMENTAL RESOURCES: The environmental resources within the project boundaries and those affected outside the limits of permanent work under this contract shall be protected during the entire period of this contract. The Contractor shall confine his activities to

areas defined by the drawings and specifications. Environmental protection shall be as stated in the following subparagraphs:

7.1 Protection of Land Resources. Prior to the start of any construction, the Contractor shall identify all land resources to be preserved within the Contractor's work area. The Contractor shall not remove, cut, deface, injure, or destroy land resources, including trees, shrubs, vines, grasses, topsoil, and land forms, without special permission from the Contracting Officer. No ropes, cables, or guys shall be fastened or attached to any trees for anchorage unless specifically authorized. Where such special emergency use is permitted, the Contractor shall provide effective protection for land and vegetation resources at all times.

7.1.1 Forest Resources. Merchantable timber and pine straw shall neither be cut nor removed from the construction site until it has been assessed by the Savannah District Timber Harvest Office in conjunction with PWBC Natural Resources Branch. The Savannah District Timber Harvest Office will be given adequate time to arrange for the sale and removal of timber and pine straw. In the event that the Savannah District and Natural Resources Branch determine the amount or quality of timber or pine straw is not merchantable, they will inform the Contracting Officer. The Contracting Officer will authorize the Contractor to remove forest resources which are in the footprint of construction.

7.1.2 Work Area Limits. Prior to any construction, the Contractor shall mark the areas that are not required to accomplish all work to be performed under this contract. Isolated areas within the general work area which are to be saved and protected shall also be marked or fenced. Monuments and markers shall be protected before construction operations begin. Where construction operations are to be conducted during darkness, the markers shall still remain visible. The Contractor shall convey to his personnel the purpose of marking and/or protection of all necessary objects. Damage to protected areas/objects shall be repaired immediately by the Contractor at no additional cost to the Government.

7.1.3 Protection of Landscape. Trees, shrubs, vines, grasses, land forms, and other landscape features indicated and defined on the drawings to be preserved shall be clearly identified by marking, fencing, wrapping, or any other approved techniques.

7.1.4 Reduction of Exposure of Unprotected Erodible Soils. Earthwork brought to final grade shall be finished as indicated and specified. Side slopes and back slopes shall be protected as soon as practicable upon completion of rough grading. All earthwork shall be planned and conducted to minimize the duration of exposure of unprotected soils. Except in instances where the constructed feature obscures borrow areas, quarries, and waste material areas, these areas shall not initially be cleared in total. Clearing of such areas shall progress in reasonably sized increments as needed to use the areas as approved by the Contracting Officer.

7.1.4.1 Erosion and Sedimentation Control Plan. When the total area of land disturbed is 1 acre or more in size, an Erosion and Sedimentation Control Plan shall be prepared by the Contractor. The plan will be prepared in accordance with North Carolina Administrative Code, Title 15, Department of Natural and Economic Resources, Chapter 4, Sedimentation Control, January 1978. This plan is to be prepared, approved, and filed as part of the design prior to the start of any land-disturbing activity. When the area to be disturbed is less than 1 acre, a formal plan will not be required; however, erosion and sedimentation control measures will be incorporated as part of

the design.

7.1.5 Temporary Protection of Disturbed Areas. Such methods as necessary shall be utilized to effectively prevent erosion and control sedimentation at all times including, but not limited to, the following:

7.1.5.1 Control of Runoff. Runoff from the construction site shall be controlled by construction of diversion ditches, benches, and silt basins; by checking dams and berms to reduce the velocity and divert runoff to protected drainage courses; and by any measures required by areawide plans approved under paragraph 208 of the Clean Water Act.

7.1.5.2 Sediment Basins. Sediment from construction areas shall be trapped in temporary or permanent sediment basins in accordance with basin plans shown on the drawings. The basins shall accommodate the runoff of a local 5-year design storm. They shall be constructed as approved by the Contracting Officer to prevent sedimentation of downstream or downslope areas.

7.1.6 Disposal of Chemical Waste. The Contractor is responsible for the proper use, storage, and disposal of chemical material and waste in accordance with Fort Bragg Regulation 200-2. The PWBC Environmental/Natural Resources Division has established the following requirements in order for the post to remain in compliance with hazardous waste requirements as established by both State of North Carolina and Federal environmental laws:

7.1.6.1 Compatible Containers. Chemical waste shall be contained in and stored in aboveground compatible containers. Hazardous wastes shall not be stored underground. Any release or spill to the environment will be immediately reported to the PWBC Fire Department at telephone (910) 396-3015 and to the PWBC Environmental/Natural Resources Division at telephone (910) 396-3341.

7.1.6.2 Recycling. The Contractor is encouraged to provide for recycling of waste through the Defense Reutilization and Marketing Office, Fort Bragg.

7.1.6.3 Chemical Analysis. The Contractor is responsible for obtaining chemical analyses of all chemical wastes. All chemical waste shall be disposed of in accordance with Fort Bragg's Waste Analysis Plan. Sampling of suspected hazardous waste is required to determine the hazardous waste characterization of the material. The Contractor is required to notify the contract inspector 1 day before the samples are taken. Samples shall be delivered by the contract inspector to the PWBC Environmental/Natural Resources Division for transmittal to an independent analytical laboratory. The laboratory shall be listed in the Environmental Protection Plan approved by the PWBC Environmental/Natural Resources Division.

7.1.6.4 Nonhazardous Waste. Waste that has been certified as nonhazardous waste may be removed off the project site by the Contractor. These wastes shall be disposed of in accordance with all applicable State of North Carolina requirements and U.S. Army Center for Health Promotion and Preventive Medicine (CHPPM) guidance. The Contractor shall address the disposal method and location of the disposal site for each chemical waste in the Environmental Protection Plan for the project.

7.1.6.5 Hazardous Waste. The Contractor may not normally remove hazardous waste from Fort Bragg. Removal shall be performed by a licensed hazardous waste firm. The hazardous waste contractor shall prepare the hazardous waste manifest form for signature by the Environmental/Natural Resources Division before each shipment of hazardous waste. Refer to Fort Bragg Regulation 200-2.



7.1.6.6 Labeling. Each container of hazardous waste shall be immediately labeled with a hazardous waste label and marked with the current date once any hazardous waste is put in the container. The Contractor shall keep the containers closed and inspect them weekly for signs of rust or deterioration.

Inspection results shall be documented. Additionally, the U.S. Department of Transportation Shipping Name shall be marked on each container before it is removed from Fort Bragg. Refer to Fort Bragg Regulation 200-2.

7.1.6.7 Training. The Contractor shall ensure all of his employees who handle hazardous waste are trained in the management requirements for hazardous waste. Two hours of on-the-job training by the Environmental/Natural Resources Division will be scheduled for the first Wednesday of each month. All Contractor employees physically handling or managing waste media shall receive this training. Refer to Fort Bragg Regulation 200-2.

7.1.7 Disposal of Discarded Materials. Discarded materials, other than those which can be included in the solid waste category, will be handled as directed by the Contracting Officer. Construction and demolition debris shall be disposed of at the Fort Bragg Demolition Landfill on Lamont Road, and materials contaminated by asbestos or lead paint shall be contained and disposed of in the Asbestos Section of the Demolition Landfill. A permit from the PWBC Environmental/Natural Resources Division (building 3-1333) is required to dispose of materials in the landfills on post.

7.2 Preservation and Recovery of Historical, Archeological, and Cultural Resources. Existing historical, archeological, and cultural resources within the Contractor's work area will be designated by the Contracting Officer and precautions taken to preserve all significant resources as they existed at the time they were pointed out to the Contractor. The Contracting Officer's guidance shall be taken from the recommendations of the Cultural Resources Survey produced for the project area by the Savannah District, U.S. Army Corps of Engineers. The Contractor shall install all protection for resources designated on the drawings and shall be responsible for their preservation during this contract.

7.2.1 Artifacts Discovered During Construction. Any unforeseen historical or archeological finds encountered during Contractor operations shall be justification to cease all activity in the affected area. The PWBC Environmental/Natural Resources Division shall be promptly notified. They will determine the significance of the findings, if necessary, after consultation with the North Carolina State Historic Preservation Officer, prior to authorizing the Contractor to resume operations in that area.

7.2.2 Cultural Resources Protected by Law. Cultural resources on Federal property are protected and managed by the Archeological Resources Protection Act of 1979, and other applicable laws. Artifacts may be collected on Fort Bragg only after approval by the Savannah District and the PWBC Environmental/Natural Resources Office as part of a controlled research design for scientific and cultural purposes. Collection for personal use is not authorized. Conviction subjects the violator to civil and criminal penalties.

7.3 Protection of Water Resources. The Contractor shall keep construction activities under surveillance, management, and control to avoid pollution of surface and ground waters. Special management techniques shall be implemented to control water pollution by any construction activities which are included in performing this contract.

7.3.1 Monitoring of Environmental Damage. Monitoring of water courses and wetland affected by construction activities shall be the responsibility of the Contractor. Wetland is intolerant to disturbance and will require special design and management to prevent encroachment. During construction, action will be required to maintain buffer areas and soil erosion control measures near water are as which could be adversely affected by construction activities.

7.4 Protection of Wildlife and Wildlife Habitat. The Contractor shall keep construction activities under surveillance, management, and control to minimize interference with, disturbance to, and damage of wildlife. Information concerning any species that require specific attention, along with measures for their protection, will be given by the PWBC Environmental/Natural Resources Division to the Contractor prior to start of construction operations.

7.4.1 Endangered Species Act. The Federal Endangered Species Act of 1973, as amended in 1982, requires that Federal lands be assessed for impacts upon endangered species and that such species be managed and protected. Although there are a number of rare, threatened, or endangered plant and animal species on Fort Bragg which are listed by either the Federal or State government, the species most often of concern are an endangered bird, the red-cockaded woodpecker (RCW) (*Picoides borealis*) and two endangered plants, the rough-leaf loosestrife (RLLS) (*Lysimachia asperulaefolia*) and Michaux's Sumac (MS) (*Rhus michauxii*). Species proposed for listing under the provisions of the Federal Endangered Species Act are entitled to the same protection as those actually listed.

7.4.2 Red-Cockaded Woodpecker. The RCW is dependent upon large numbers of mature pine trees for its survival. The birds are not tolerant of disturbance. Their habitat is managed by the PWBC Environmental/Natural Resources Division, Endangered Species Branch. The habitat of the RCW is marked in the following manner: (1) Cavity trees which are used by the birds for roosting and nesting are marked with two broad bands of white paint; and (2) Each colony site is protected by a buffer area at least 200 feet in diameter around the cavity trees; trees on the edge of the buffer area are marked with a single broad band of white paint. Fixed activity such as storage of construction materials, operation of concrete batch plants, or parking vehicles is not authorized inside the buffer area. Molesting the birds or damaging their habitat is a violation of the Endangered Species Act. Conviction can subject the violator to severe civil and criminal penalties.

7.4.3 Endangered Plants. Endangered plants are dependent for their survival upon specific environmental conditions such as soil type, slope aspect, moisture, and light. They are not tolerant of disturbance. Their habitat is managed by the PWBC Environmental/Natural Resources Division, Endangered Species Branch. Each colony site is protected by a buffer area at least 200 feet in diameter. Trees on the edge of the buffer area are marked with a single broad band of white paint. Fixed activity such as storage of construction materials, operation of concrete batch plants, or parking vehicles is prohibited inside the buffer area. Damaging the habitat of endangered plants is a violation of the Endangered Species Act. Conviction can subject the violator to severe civil and criminal penalties.

7.5 Protection of Air Resources. The Contractor shall keep construction activities under surveillance, management, and control to minimize pollution of air resources. All activities, equipment, processes, and work operated or

performed by the Contractor in accomplishing the specified construction shall be in strict accordance with all State of North Carolina and Federal emission and performance laws and standards. Ambient Air Quality Standards set by the Environmental Protection Agency (EPA) shall be maintained for all construction operations and activities. The Contractor shall have sufficient functional equipment available to accomplish the task.

7.5.1 Particulates. Dust particles, aerosols, and gaseous byproducts from all construction activities and the processing and preparation of materials, such as from asphaltic bath plants, shall be controlled at all times.

7.5.2 Odors. Odors shall be controlled at all times for all construction activities, processing, and preparation of materials.

7.5.3 Air Quality. Monitoring of air quality shall be the responsibility of the Contractor. All air areas affected by the construction activities shall be monitored by the Contractor when directed by the Contracting Officer.

7.6 Reduction of Sound Intrusions. The Contractor shall keep construction activities under surveillance and control to minimize disturbances caused by excessive noise. Equipment shall have properly operating noise-muffling devices for the entire length of the contract.

7.7 Application of Pesticides. The Contractor shall apply all pesticides in accordance with the requirements of the Federal Insecticide, Fungicide, and Rodenticide Act, using pesticides approved by the EPA and following the instructions on the manufacturer's label. Application of termiticides during construction, if applicable, will be addressed in technical provision section 02315 - Excavation, Filling, and Backfilling for Buildings in Paragraph 16, Soil Treatment.

7.7.1 Licensing and Certification. All pesticide applications shall be performed by a Contractor certified in the EPA category or categories which cover the work to be performed and shall hold a valid business license. For work at Fort Bragg, the Contractor shall be certified and licensed by the State of North Carolina. The Contractor shall present evidence of such licensing and certification to the Contracting Officer for approval prior to award of the contract.

8. POST-CONSTRUCTION CLEANUP: The Contractor shall be responsible to clean up all areas affected by the construction and restore them back to at least their original condition to include landscaping; planting of trees, grass, and shrubs damaged by construction; and raking and disposal of debris such as roofing shingles, paper, nails, glass, sheet metal, bricks, and waste concrete. Backfilled areas shall be machine compacted and replanted with grass. Construction debris shall be removed and properly disposed of. Culverts and drainages with sediment from the construction area shall be cleared routinely to maintain proper drainage and recleaned prior to completion of the contract.

9. RESTORATION OF LANDSCAPE DAMAGE: The Contractor shall restore all landscape features damaged or destroyed during construction operations outside the limits of the approved work areas. Such restoration shall be in accordance with the Environmental Protection Plan submitted for approval to the Contracting Officer. This work will be accomplished at the Contractor's expense.

10. MAINTENANCE OF POLLUTION CONTROL FACILITIES: The Contractor shall maintain all constructed facilities and portable pollution control devices

for the duration of the contract or for the length of time construction activities produce the particular pollutant.

10.1 Containment Berms. The Contractor shall build a containment berm around temporary aboveground fuel storage tanks. The bermed area shall be large enough to contain 125 percent of the volume of the storage tanks if there is a leak. The Contractor shall not install any temporary underground storage tanks.

10.2 Erosion Control Devices. The Contractor shall immediately repair any damaged erosion control structures, such as silt fences, and remove accumulated sediment.

10.3 Storm Drains. The Contractor shall ensure sediment does not block storm drains. The Contractor shall be responsible for cleaning storm drains blocked due to erosion of sediment off site.

11. TRAINING OF CONTRACTOR PERSONNEL IN POLLUTION CONTROL: The Contractor shall train his personnel in all phases of environmental protection. The training shall include methods of detecting and avoiding pollution, familiarization with pollution standards, both statutory and contractual, and installation and care of facilities (vegetative covers and instruments required for monitoring purposes) to ensure adequate and continuous environmental pollution control. Such training shall be completed before contract work begins.

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SECTION 02220

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SECTION 02220

DEMOLITION

12/97

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ENGINEERING MANUALS (EM)

EM 385-1-1 (1996) U.S. Army Corps of Engineers Safety and Health Requirements Manual

1.2 GENERAL REQUIREMENTS

The work includes demolition, salvage of identified items and materials, and removal of resulting rubbish and debris. Rubbish and debris shall be removed from Government property daily, unless otherwise directed, to avoid accumulation at the demolition site. Materials that cannot be removed daily shall be stored in areas specified by the Contracting Officer. In the interest of occupational safety and health, the work shall be performed in accordance with EM 385-1-1, Section 23, Demolition, and other applicable Sections. In the interest of conservation, salvage shall be pursued to the maximum extent possible; salvaged items and materials shall be disposed of as specified.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Work Plan; G

The procedures proposed for the accomplishment of the work. The procedures shall provide for safe conduct of the work, including procedures and methods to provide necessary supports, lateral bracing and shoring when required, careful removal and disposition of materials specified to be salvaged, protection of property which is to remain undisturbed, coordination with other work in progress, and timely disconnection of utility services. The procedures shall include a detailed description of the methods and equipment to be used for each operation, and the sequence of operations in accordance with EM 385-1-1.

1.4 DUST CONTROL

The amount of dust resulting from demolition shall be controlled to prevent the spread of dust to occupied portions of the construction site and to

avoid creation of a nuisance in the surrounding area. Use of water will not be permitted when it will result in, or create, hazardous or objectionable conditions such as ice, flooding and pollution.

## 1.5 PROTECTION

### 1.5.1 Protection of Personnel

During the demolition work the Contractor shall continuously evaluate the condition of the structure being demolished and take immediate action to protect all personnel working in and around the demolition site. No area, section, or component of floors, roofs, walls, columns, pilasters, or other structural element will be allowed to be left standing without sufficient bracing, shoring, or lateral support to prevent collapse or failure while workmen remove debris or perform other work in the immediate area.

### 1.5.2 Protection of Structures

Floors, roofs, walls, columns, pilasters, and other structural components that are designed and constructed to stand without lateral support or shoring, and are determined to be in stable condition, shall remain standing without additional bracing, shoring, or lateral support until demolished, unless directed otherwise by the Contracting Officer. The Contractor shall ensure that no elements determined to be unstable are left unsupported and shall be responsible for placing and securing bracing, shoring, or lateral supports as may be required as a result of any cutting, removal, or demolition work performed under this contract.

### 1.5.3 Protection of Existing Property

Before beginning any demolition work, the Contractor shall survey the site and examine the drawings and specifications to determine the extent of the work. The Contractor shall take necessary precautions to avoid damage to existing items to remain in place, to be reused, or to remain the property of the Government; any damaged items shall be repaired or replaced as approved by the Contracting Officer. The Contractor shall coordinate the work of this section with all other work and shall construct and maintain shoring, bracing, and supports as required. The Contractor shall ensure that structural elements are not overloaded and shall be responsible for increasing structural supports or adding new supports as may be required as a result of any cutting, removal, or demolition work performed under this contract.

### 1.5.4 Protection From the Weather

The interior of buildings to remain; salvageable materials and equipment shall be protected from the weather at all times.

### 1.5.5 Protection of Trees

Trees within the project site which might be damaged during demolition, and which are indicated to be left in place, shall be protected by a 1 BO meter high fence. The fence shall be securely erected a minimum of 6.5 feet from the trunk of individual trees or follow the outer perimeter of branches or clumps of trees. Any tree designated to remain that is damaged during the work under this contract shall be replaced in kind or as approved by the Contracting Officer.

### 1.5.6 Environmental Protection

The work shall comply with the requirements of Section 01410 ENVIRONMENT PROTECTION.

#### 1.6 BURNING

The use of burning at the project site for the disposal of refuse and debris will not be permitted.

#### 1.7 USE OF EXPLOSIVES

Use of explosives will not be permitted.

### PART 2 PRODUCTS (Not Applicable)

### PART 3 EXECUTION

#### 3.1 EXISTING STRUCTURES

Existing structures indicated shall be removed to grade. Sidewalks, curbs, gutters and street light bases shall be removed as indicated.

#### 3.2 UTILITIES

Existing utilities shall be removed as indicated. When utility lines are encountered that are not indicated on the drawings, the Contracting Officer shall be notified prior to further work in that area.

#### 3.3 FILLING

Holes, open basements and other hazardous openings shall be filled in accordance with Section 02300 Earthwork.

#### 3.4 DISPOSITION OF MATERIAL

Title to material and equipment to be demolished, except Government salvage and historical items, is vested in the Contractor upon receipt of notice to proceed. The Government will not be responsible for the condition, loss or damage to such property after notice to proceed.

##### 3.4.1 Salvageable Items and Material

Contractor shall salvage items and material to the maximum extent possible.

##### 3.4.1.1 Material Salvaged for the Contractor

Material salvaged for the Contractor shall be stored as approved by the Contracting Officer and shall be removed from Government property before completion of the contract. Material salvaged for the Contractor shall not be sold on the site.

##### 3.4.1.2 Items Salvaged for the Government

Salvaged items to remain the property of the Government shall be removed in a manner to prevent damage, and packed or crated to protect the items from damage while in storage or during shipment. Items damaged during removal or storage shall be repaired or replaced to match existing items. Containers shall be properly identified as to contents.



### 3.5 CLEAN UP

Debris and rubbish shall be removed from basement and similar excavations. Debris shall be removed and transported in a manner that prevents spillage on streets or adjacent areas. Local regulations regarding hauling and disposal shall apply.

### 3.6 PAVEMENTS

Existing pavements designated for removal shall be saw cut and removed in accordance with the details shown on the drawings and to the limits and depths indicated on the drawings.

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SECTION 02230

CLEARING AND GRUBBING

06/97

PART 1 GENERAL

1.1 DEFINITIONS

1.1.1 Clearing

Clearing shall consist of the felling, trimming, and cutting of trees into sections and the satisfactory disposal of the trees and other vegetation designated for removal, including down timber, snags, brush, and rubbish occurring in the areas to be cleared.

1.1.2 Grubbing

Grubbing shall consist of the removal and disposal of stumps, roots larger than 3 inches in diameter, and matted roots from the designated grubbing areas.

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Materials Other Than Salable Timber

Written permission to dispose of such products on private property shall be filed with the Contracting Officer.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 CLEARING

Trees, stumps, roots, brush, and other vegetation in areas to be cleared shall be cut off flush with or below the original ground surface, except such trees and vegetation as may be indicated or directed to be left standing. Trees designated to be left standing within the cleared areas shall be trimmed of dead branches 1.5 inches or more in diameter and shall be trimmed of all branches the heights indicated or directed. Limbs and branches to be trimmed shall be neatly cut close to the bole of the tree or main branches. Cuts more than 1.5 inches in diameter shall be painted with an approved tree-wound paint. Trees and vegetation to be left standing shall be protected from damage incident to clearing, grubbing, and construction operations by the erection of barriers or by such other means as the circumstances require. Clearing shall also include the removal and disposal of structures that obtrude, encroach upon, or otherwise obstruct the work.

### 3.2 GRUBBING

Material to be grubbed, together with logs and other organic or metallic debris not suitable for foundation purposes, shall be removed to a depth of not less than 18 inches below the original surface level of the ground in areas indicated to be grubbed and in areas indicated as construction areas under this contract, such as areas for buildings, and areas to be paved. Depressions made by grubbing shall be filled with suitable material and compacted to make the surface conform with the original adjacent surface of the ground.

### 3.3 TREE REMOVAL

Where indicated or directed, trees and stumps that are designated as trees shall be removed from areas outside those areas designated for clearing and grubbing. This work shall include the felling of such trees and the removal of their stumps and roots as specified in paragraph GRUBBING. Trees shall be disposed of as specified in paragraph DISPOSAL OF MATERIALS.

### 3.4 DISPOSAL OF MATERIALS

#### 3.4.1 Salable Timber

All felled timber from which saw logs, pulpwood, posts, poles, ties, mine props, or cordwood can be produced shall be considered as salable timber, and shall be trimmed of limbs and tops, sawed into salable lengths of 4 feet, and stockpiled at locations as directed. The disposal of the stockpiled timber will be by the Government.

#### 3.4.2 Materials Other Than Salable Timber

Logs, stumps, roots, brush, rotten wood, and other refuse from the clearing and grubbing operations, except for salable timber, shall be disposed of outside the limits of Government-controlled land at the Contractor's responsibility, except when otherwise directed in writing. Such directive will state the conditions covering the disposal of such products and will also state the areas in which they may be placed.

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**12/97**

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SECTION 02300

EARTHWORK

**12/97**

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 136	(1996a) Sieve Analysis of Fine and Coarse Aggregates
ASTM D 422	(1963; R 1998) Particle-Size Analysis of Soils
ASTM D 1140	(1997) Amount of Material in Soils Finer than the No. 200 Sieve
ASTM D 1556	(1990; R 1996) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(1998) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu. m.))
ASTM D 2167	(1994) Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D 2487	(1998) Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2937	(1994) Density of Soil in Place by the Drive-Cylinder Method
ASTM D 4318	(1998) Liquid Limit, Plastic Limit, and Plasticity Index of Soils

1.2 DEFINITIONS

1.2.1 Satisfactory Materials

Satisfactory materials shall comprise any materials classified by ASTM D 2487 as GW, GP, GM, SW, SP, SC, ML. Satisfactory materials for grading shall be comprised of stones less than , except for fill material for pavements and railroads which shall be comprised of stones less than 3 inches, in any dimension.

1.2.2 Unsatisfactory Materials

Materials which do not comply with the requirements for satisfactory

materials are unsatisfactory. Unsatisfactory materials also include man-made fills; trash; refuse; backfills from previous construction; and material classified as satisfactory which contains root and other organic matter or frozen material. The Contracting Officer shall be notified of any contaminated materials.

#### 1.2.3 Cohesionless and Cohesive Materials

Cohesionless materials include materials classified in ASTM D 2487 as GW, GP, SW, and SP. Cohesive materials include materials classified as GC, SC, ML, CL, MH, and CH. Materials classified as GM and SM will be identified as cohesionless only when the fines are nonplastic. Testing required for classifying materials shall be in accordance with ASTM D 4318, ASTM C 136, ASTM D 422, and ASTM D 1140.

#### 1.2.4 Degree of Compaction

Degree of compaction required is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557 abbreviated as a percent of laboratory maximum density.

#### 1.2.5 Overhaul

Overhaul is the product of the quantity of materials hauled beyond the free-haul limit, and the distance such materials are hauled beyond the free-haul limit, expressed in station feet.

#### 1.2.6 Topsoil

Material suitable for topsoils obtained from offsite areas is defined as loose, friable, organic soil suitable for growing turf and having the minimum following composition: Silt 25-50%, Clay 10-30%, Sand 20-35%, pH 5-7.6, Soluble Salt 600 ppm maximum and a maximum particle size of .75.

### 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

#### SD-03 Product Data

##### Earthwork

Notification of encountering rock in the project. Advance notice on the opening of excavation or borrow areas. Advance notice on shoulder construction for rigid pavements.

Procedure and location for disposal of unused satisfactory material. Blasting plan when blasting is permitted. Proposed source of borrow material.

#### SD-06 Test Reports

##### Testing; G

Within 24 hours of conclusion of physical tests, 6 copies of



test results, including calibration curves and results of calibration tests.

#### 1.4 CLASSIFICATION OF EXCAVATION

No consideration will be given to the nature of the materials, and all excavation will be designated as unclassified excavation.

#### 1.5 BLASTING

Blasting will not be permitted.

#### 1.6 UTILIZATION OF EXCAVATED MATERIALS

Unsatisfactory materials removed from excavations shall be disposed of in designated waste disposal or spoil areas. Satisfactory material removed from excavations shall be used, insofar as practicable, in the construction of fills, embankments, subgrades, shoulders, bedding (as backfill), and for similar purposes. No satisfactory excavated material shall be wasted without specific written authorization. Satisfactory material authorized to be wasted shall be disposed of in designated areas approved for surplus material storage or designated waste areas as directed. Newly designated waste areas on Government-controlled land shall be cleared and grubbed before disposal of waste material thereon. Coarse rock from excavations shall be stockpiled and used for constructing slopes or embankments adjacent to streams, or sides and bottoms of channels and for protecting against erosion. No excavated material shall be disposed of to obstruct the flow of any stream, endanger a partly finished structure, impair the efficiency or appearance of any structure, or be detrimental to the completed work in any way.

#### PART 2 PRODUCTS (Not Applicable)

#### PART 3 EXECUTION

##### 3.1 STRIPPING OF TOPSOIL

Where indicated or directed, topsoil shall be stripped to a depth of 6 inches. Topsoil shall be spread on areas already graded and prepared for topsoil, or transported and deposited in stockpiles convenient to areas that are to receive application of the topsoil later, or at locations indicated or specified. Topsoil shall be kept separate from other excavated materials, brush, litter, objectionable weeds, roots, stones larger than 2 inches in diameter, and other materials that would interfere with planting and maintenance operations. Any surplus of topsoil from excavations and grading shall be stockpiled in locations indicated.

##### 3.2 GENERAL EXCAVATION

The Contractor shall perform excavation of every type of material encountered within the limits of the project to the lines, grades, and elevations indicated and as specified. Grading shall be in conformity with the typical sections shown and the tolerances specified in paragraph FINISHING. Satisfactory excavated materials shall be transported to and placed in fill or embankment within the limits of the work. Unsatisfactory materials encountered within the limits of the work shall be excavated below grade and replaced with satisfactory materials as directed. Such excavated material and the satisfactory material ordered as replacement

shall be included in excavation. Surplus satisfactory excavated material not required for fill or embankment shall be disposed of in areas approved for surplus material storage or designated waste areas. Unsatisfactory excavated material shall be disposed of in designated waste or spoil areas.

During construction, excavation and fill shall be performed in a manner and sequence that will provide proper drainage at all times. Material required for fill or embankment in excess of that produced by excavation within the grading limits shall be excavated from the borrow areas indicated or from other approved areas selected by the Contractor as specified.

### 3.2.1 Ditches, Gutters, and Channel Changes

Excavation of ditches, gutters, and channel changes shall be accomplished by cutting accurately to the cross sections, grades, and elevations shown. Ditches and gutters shall not be excavated below grades shown. Excessive open ditch or gutter excavation shall be backfilled with satisfactory, thoroughly compacted, material or with suitable stone or cobble to grades shown. Material excavated shall be disposed of as shown or as directed, except that in no case shall material be deposited less than 4 feet from the edge of a ditch. The Contractor shall maintain excavations free from detrimental quantities of leaves, brush, sticks, trash, and other debris until final acceptance of the work.

### 3.2.2 Drainage Structures

Excavations shall be made to the lines, grades, and elevations shown, or as directed. Trenches and foundation pits shall be of sufficient size to permit the placement and removal of forms for the full length and width of structure footings and foundations as shown. Rock or other hard foundation material shall be cleaned of loose debris and cut to a firm, level, stepped, or serrated surface. Loose disintegrated rock and thin strata shall be removed. When concrete or masonry is to be placed in an excavated area, the bottom of the excavation shall not be disturbed. Excavation to the final grade level shall not be made until just before the concrete or masonry is to be placed. Where pile foundations are to be used, the excavation of each pit shall be stopped at an elevation above the base of the footing, as specified, before piles are driven. After the pile driving has been completed, loose and displaced material shall be removed and excavation completed, leaving a smooth, solid, undisturbed surface to receive the concrete or masonry.

### 3.3 SELECTION OF BORROW MATERIAL

Borrow material shall be selected to meet the requirements and conditions of the particular fill or embankment for which it is to be used. Borrow material shall be obtained from the borrow areas shown or from other approved sources, either private or within the limits of the project site, selected by the Contractor. Unless otherwise provided in the contract, the Contractor shall obtain from the owners the right to procure material, pay royalties and other charges involved, and bear the expense of developing the sources, including rights-of-way for hauling. Borrow material from approved sources on Government-controlled land may be obtained without payment of royalties. Unless specifically provided, no borrow shall be obtained within the limits of the project site without prior written approval. Necessary clearing, grubbing, and satisfactory drainage of borrow pits and the disposal of debris thereon shall be considered related operations to the borrow excavation.

### 3.4 OPENING AND DRAINAGE OF EXCAVATION AND BORROW PITS

The Contractor shall notify the Contracting Officer sufficiently in advance of the opening of any excavation or borrow pit to permit elevations and measurements of the undisturbed ground surface to be taken. Except as otherwise permitted, borrow pits and other excavation areas shall be excavated providing adequate drainage. Overburden and other spoil material shall be transported to designated spoil areas or otherwise disposed of as directed. Borrow pits shall be neatly trimmed and drained after the excavation is completed. The Contractor shall ensure that excavation of any area, operation of borrow pits, or dumping of spoil material results in minimum detrimental effects on natural environmental conditions.

### 3.5 GRADING AREAS

Where indicated, work will be divided into grading areas within which satisfactory excavated material shall be placed in embankments, fills, and required backfills. The Contractor shall not haul satisfactory material excavated in one grading area to another grading area except when so directed in writing.

### 3.6 BACKFILL

Backfill adjacent to any and all types of structures shall be placed and compacted to at least 90 percent laboratory maximum density for cohesive materials or 95 percent laboratory maximum density for cohesionless materials to prevent wedging action or eccentric loading upon or against the structure. Ground surface on which backfill is to be placed shall be prepared as specified in paragraph PREPARATION OF GROUND SURFACE FOR EMBANKMENTS. Compaction requirements for backfill materials shall also conform to the applicable portions of paragraphs PREPARATION OF GROUND SURFACE FOR EMBANKMENTS, EMBANKMENTS, and SUBGRADE PREPARATION, and Section 02630 STORM-DRAINAGE SYSTEM; and Section 02316 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment.

### 3.7 PREPARATION OF GROUND SURFACE FOR EMBANKMENTS

#### 3.7.1 General Requirements

Ground surface on which fill is to be placed shall be stripped of live, dead, or decayed vegetation, rubbish, debris, and other unsatisfactory material; plowed, disked, or otherwise broken up to a depth of 12 inches; pulverized; moistened or aerated as necessary; thoroughly mixed; and compacted to at least 90 percent laboratory maximum density for cohesive materials or 95 percent laboratory maximum density for cohesionless materials. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment. The prepared ground surface shall be scarified and moistened or aerated as required just prior to placement of embankment materials to assure adequate bond between embankment material and the prepared ground surface.

#### 3.7.2 Frozen Material

Embankment shall not be placed on a foundation which contains frozen material, or which has been subjected to freeze-thaw action. This prohibition encompasses all foundation types, including the natural ground,

all prepared subgrades (whether in an excavation or on an embankment) and all layers of previously placed and compacted earth fill which become the foundations for successive layers of earth fill. All material that freezes or has been subjected to freeze-thaw action during the construction work, or during periods of temporary shutdowns, such as, but not limited to, nights, holidays, weekends, winter shutdowns, or earthwork operations, shall be removed to a depth that is acceptable to the Contracting Officer and replaced with new material. Alternatively, the material will be thawed, dried, reworked, and recompactd to the specified criteria before additional material is placed. The Contracting Officer will determine when placement of fill shall cease due to cold weather. The Contracting Officer may elect to use average daily air temperatures, and/or physical observation of the soils for his determination. Embankment material shall not contain frozen clumps of soil, snow, or ice.

### 3.8 EMBANKMENTS

#### 3.8.1 Earth Embankments

Earth embankments shall be constructed from satisfactory materials free of organic or frozen material and rocks with any dimension greater than 3 inches. The material shall be placed in successive horizontal layers of loose material not more than 12 inches in depth. Each layer shall be spread uniformly on a soil surface that has been moistened or aerated as necessary, and scarified or otherwise broken up so that the fill will bond with the surface on which it is placed. After spreading, each layer shall be plowed, disked, or otherwise broken up; moistened or aerated as necessary; thoroughly mixed; and compacted to at least 90 percent laboratory maximum density for cohesive materials or 95 percent laboratory maximum density for cohesionless materials. Compaction requirements for the upper portion of earth embankments forming subgrade for pavements shall be identical with those requirements specified in paragraph SUBGRADE PREPARATION. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment.

### 3.9 SUBGRADE PREPARATION

#### 3.9.1 Construction

Subgrade shall be shaped to line, grade, and cross section, and compacted as specified. This operation shall include plowing, disking, and any moistening or aerating required to obtain specified compaction. Soft or otherwise unsatisfactory material shall be removed and replaced with satisfactory excavated material or other approved material as directed. Rock encountered in the cut section shall be excavated to a depth of 6 inches below finished grade for the subgrade. Low areas resulting from removal of unsatisfactory material or excavation of rock shall be brought up to required grade with satisfactory materials, and the entire subgrade shall be shaped to line, grade, and cross section and compacted as specified. After rolling, the surface of the subgrade for roadways shall not show deviations greater than .5 inches when tested with a 10 foot straightedge applied both parallel and at right angles to the centerline of the area. The elevation of the finish subgrade shall not vary more than .5 inches from the established grade and cross section.

#### 3.9.2 Compaction

Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired

rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment. Except for paved areas and railroads, each layer of the embankment shall be compacted to at least 95 percent of laboratory maximum density.

#### 3.9.2.1 Subgrade for Railroads

Subgrade for railroads shall be compacted to at least 90 percent laboratory maximum density for cohesive materials or 95 percent laboratory maximum density for cohesionless materials.

#### 3.9.2.2 Subgrade for Pavements

Subgrade for pavements shall be compacted to at least 95 percentage laboratory maximum density for the depth below the surface of the pavement shown. When more than one soil classification is present in the subgrade, the top 6 inches of subgrade shall be scarified, windrowed, thoroughly blended, reshaped, and compacted.

#### 3.9.2.3 Subgrade for Shoulders

Subgrade for shoulders shall be compacted to at least 90 percentage laboratory maximum density for the full depth of the shoulder.

### 3.10 SHOULDER CONSTRUCTION

Shoulders shall be constructed of satisfactory excavated or borrow material or as otherwise shown or specified. Shoulders shall be constructed as soon as possible after adjacent paving is complete, but in the case of rigid pavements, shoulders shall not be constructed until permission of the Contracting Officer has been obtained. The entire shoulder area shall be compacted to at least the percentage of maximum density as specified in paragraph SUBGRADE PREPARATION above, for specific ranges of depth below the surface of the shoulder. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment. Shoulder construction shall be done in proper sequence in such a manner that adjacent ditches will be drained effectively and that no damage of any kind is done to the adjacent completed pavement. The completed shoulders shall be true to alignment and grade and shaped to drain in conformity with the cross section shown.

### 3.11 FINISHING

The surface of excavations, embankments, and subgrades shall be finished to a smooth and compact surface in accordance with the lines, grades, and cross sections or elevations shown. The degree of finish for graded areas shall be within 0.1 foot of the grades and elevations indicated except that the degree of finish for subgrades shall be specified in paragraph SUBGRADE PREPARATION. Gutters and ditches shall be finished in a manner that will result in effective drainage. The surface of areas to be turfed shall be finished to a smoothness suitable for the application of turfing materials.

### 3.12 PLACING TOPSOIL

On areas to receive topsoil, the compacted subgrade soil shall be scarified to a depth for bonding of topsoil with subsoil. Topsoil then shall be spread evenly to a thickness of 4 inches and graded to the elevations and

slopes shown. Topsoil shall not be spread when frozen or excessively wet or dry. Material required for topsoil in excess of that produced by excavation within the grading limits shall be obtained from offsite areas.

### 3.13 TESTING

Testing shall be performed by an approved commercial testing laboratory or by the Contractor subject to approval. If the Contractor elects to establish testing facilities, no work requiring testing will be permitted until the Contractor's facilities have been inspected and approved by the Contracting Officer. Field in-place density shall be determined in accordance with ASTM D 1556 and ASTM D 2167. ASTM D 2937, Drive Cylinder Method shall be used only for soft, fine-grained, cohesive soils. When test results indicate, as determined by the Contracting Officer, that compaction is not as specified, the material shall be removed, replaced and recompacted to meet specification requirements. Tests on recompacted areas shall be performed to determine conformance with specification requirements. Inspections and test results shall be certified by a registered professional civil engineer. These certifications shall state that the tests and observations were performed by or under the direct supervision of the engineer and that the results are representative of the materials or conditions being certified by the tests. The following number of tests, if performed at the appropriate time, will be the minimum acceptable for each type operation.

#### 3.13.1 Fill and Backfill Material Gradation

One test per 100 cubic yards stockpiled or in-place source material. Gradation of fill and backfill material shall be determined in accordance with ASTM C 136, ASTM D 422 and ASTM D 1140.

#### 3.13.2 In-Place Densities

- a. One test per 3 square yards, or fraction thereof, of each lift of fill or backfill areas compacted by other than hand-operated machines.
- b. One test per 30 square yards, or fraction thereof, of each lift of fill or backfill areas compacted by hand-operated machines.
- c. One test per 98.5 linear feet, or fraction thereof, of each lift of embankment or backfill for roads.
- d. One test per 98.5 linear feet, or fraction thereof, of each lift of embankment or backfill for railroads.

#### 3.13.3 Check Tests on In-Place Densities

If ASTM D 2922 is used, in-place densities shall be checked by ASTM D 1556 as follows:

- a. One check test per lift for each 30 square yards, or fraction thereof, of each lift of fill or backfill compacted by other than hand-operated machines.
- b. One check test per lift for each 30 square yards, of fill or backfill areas compacted by hand-operated machines.
- c. One check test per lift for each 98.5 linear feet, or fraction

thereof, of embankment or backfill for roads.

- d. One check test per lift for each 98.5 linear feet, or fraction thereof, of embankment or backfill for railroads.

#### 3.13.4 Moisture Contents

In the stockpile, excavation, or borrow areas, a minimum of two tests per day per type of material or source of material being placed during stable weather conditions shall be performed. During unstable weather, tests shall be made as dictated by local conditions and approved by the Contracting Officer.

#### 3.13.5 Optimum Moisture and Laboratory Maximum Density

Tests shall be made for each type material or source of material including borrow material to determine the optimum moisture and laboratory maximum density values. One representative test per 1,000 cubic yards of fill and backfill, or when any change in material occurs which may affect the optimum moisture content or laboratory maximum density.

#### 3.13.6 Tolerance Tests for Subgrades

Continuous checks on the degree of finish specified in paragraph SUBGRADE PREPARATION shall be made during construction of the subgrades.

#### 3.14 SUBGRADE AND EMBANKMENT PROTECTION

During construction, embankments and excavations shall be kept shaped and drained. Ditches and drains along subgrade shall be maintained to drain effectively at all times. The finished subgrade shall not be disturbed by traffic or other operation and shall be protected and maintained by the Contractor in a satisfactory condition until ballast, subbase, base, or pavement is placed. The storage or stockpiling of materials on the finished subgrade will not be permitted. No subbase, base course, ballast, or pavement shall be laid until the subgrade has been checked and approved, and in no case shall subbase, base, surfacing, pavement, or ballast be placed on a muddy, spongy, or frozen subgrade.

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SECTION 02316

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WIDEN RANGE ROAD, RANGE 19, SOTF  
FORT BRAGG, NC (SF 00012-2)

DACA21-03-R-0046

SECTION 02316

EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS

11/97

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 1556	(1990; R 1996) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(1998) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu. m.))
ASTM D 2167	(1994) Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D 2487	(1998) Classification of Soils for Engineering Purposes (Unified Soil Classification System)

1.2 DEGREE OF COMPACTION

Degree of compaction shall be expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-06 Test Reports

Field Density Tests; G  
Testing of Backfill Materials; G

Copies of all laboratory and field test reports within 24 hours of the completion of the test.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Satisfactory Materials

Satisfactory materials shall comprise any materials classified by ASTM D

2487 as GW, GP, GM, SW, SP, SC, SP-SC, ML.

#### 2.1.2 Unsatisfactory Materials

Materials which do not comply with the requirements for satisfactory materials are unsatisfactory. Unsatisfactory materials also include man-made fills, trash, refuse, or backfills from previous construction. Unsatisfactory material also includes material classified as satisfactory which contains root and other organic matter, frozen material, and stones larger than 1.5 inches. The Contracting Officer shall be notified of any contaminated materials.

#### 2.1.3 Cohesionless and Cohesive Materials

Cohesionless materials shall include materials classified in ASTM D 2487 as GW, GP, SW, and SP. Cohesive materials shall include materials classified as GC, SC, ML, CL, MH, and CH. Materials classified as GM and SM shall be identified as cohesionless only when the fines are nonplastic.

#### 2.1.4 Rock

Rock shall consist of boulders measuring 1/2 cubic yard or more and materials that cannot be removed without systematic drilling and blasting such as rock material in ledges, bedded deposits, unstratified masses and conglomerate deposits, and below ground concrete or masonry structures, exceeding in volume, except that pavements shall not be considered as rock.

#### 2.1.5 Unyielding Material

Unyielding material shall consist of rock and gravelly soils with stones greater than 2 inches in any dimension or as defined by the pipe manufacturer, whichever is smaller.

#### 2.1.6 Unstable Material

Unstable material shall consist of materials too wet to properly support the utility pipe, conduit, or appurtenant structure.

#### 2.1.7 Select Granular Material

Select granular material shall consist of well-graded sand, gravel, crushed gravel, crushed stone or crushed slag composed of hard, tough and durable particles, and shall contain not more than 10 percent by weight of material passing a No. 200 No. 200 mesh sieve and no less than 95 percent by weight passing a 1 inch sieve. The maximum allowable aggregate size shall be 1.5 inches, or the maximum size recommended by the pipe manufacturer, whichever is smaller.

#### 2.1.8 Initial Backfill Material

Initial backfill shall consist of select granular material or satisfactory materials free from rocks 1.5 inches or larger in any dimension or free from rocks of such size as recommended by the pipe manufacturer, whichever is smaller.

#### 2.2 PLASTIC MARKING TAPE

Plastic marking tape shall be acid and alkali-resistant polyethylene film, wide with minimum thickness of .004 inches. Tape shall have a minimum

strength of 1750 psi lengthwise and 1500 psi crosswise. The tape shall be manufactured with integral wires, foil backing or other means to enable detection by a metal detector when the tape is buried up to 35.5 inches deep. The tape shall be of a type specifically manufactured for marking and locating underground utilities. The metallic core of the tape shall be encased in a protective jacket or provided with other means to protect it from corrosion. Tape color shall be as specified in TABLE 1 and shall bear a continuous printed inscription describing the specific utility.

TABLE 1. Tape Color

Red:	Electric
Yellow:	Gas, Oil, Dangerous Materials
Orange:	Telephone, Telegraph, Television, Police, and Fire Communications
Blue:	Water Systems
Green:	Sewer Systems

### PART 3 EXECUTION

#### 3.1 EXCAVATION

Excavation shall be performed to the lines and grades indicated. Rock excavation shall include removal and disposition of material defined as rock in paragraph MATERIALS. Earth excavation shall include removal and disposal of material not classified as rock excavation. During excavation, material satisfactory for backfilling shall be stockpiled in an orderly manner at a distance from the banks of the trench equal to 1/2 the depth of the excavation, but in no instance closer than 23.5 inches. Excavated material not required or not satisfactory for backfill shall be removed from the site. Grading shall be done as may be necessary to prevent surface water from flowing into the excavation, and any water accumulating shall be removed to maintain the stability of the bottom and sides of the excavation. Unauthorized overexcavation shall be backfilled in accordance with paragraph BACKFILLING AND COMPACTION at no additional cost to the Government.

##### 3.1.1 Trench Excavation Requirements

The trench shall be excavated as recommended by the manufacturer of the pipe to be installed. Trench walls below the top of the pipe shall be sloped, or made vertical, and of such width as recommended in the manufacturer's installation manual. Where no manufacturer's installation manual is available, trench walls shall be made vertical. Trench walls more than 6.5 feet high shall be shored, cut back to a stable slope, or provided with equivalent means of protection for employees who may be exposed to moving ground or cave in. Vertical trench walls more than 16.5 feet high shall be shored. Trench walls which are cut back shall be excavated to at least the angle of repose of the soil. Special attention shall be given to slopes which may be adversely affected by weather or moisture content. The trench width below the top of pipe shall not exceed plus pipe outside diameter (O.D.) for pipes of less than inside diameter and shall not exceed plus pipe outside diameter for sizes larger than inside diameter. Where recommended trench widths are exceeded, redesign, stronger pipe, or special installation procedures shall be utilized by the Contractor. The cost of redesign, stronger pipe, or special installation procedures shall be borne by the Contractor without any additional cost to the Government.

#### 3.1.1.1 Bottom Preparation

The bottoms of trenches shall be accurately graded to provide uniform bearing and support for the bottom quadrant of each section of the pipe. Bell holes shall be excavated to the necessary size at each joint or coupling to eliminate point bearing. Stones of 1.5 inches or greater in any dimension, or as recommended by the pipe manufacturer, whichever is smaller, shall be removed to avoid point bearing.

#### 3.1.1.2 Removal of Unyielding Material

Where overdepth is not indicated and unyielding material is encountered in the bottom of the trench, such material shall be removed 3 inches below the required grade and replaced with suitable materials as provided in paragraph BACKFILLING AND COMPACTION.

#### 3.1.1.3 Removal of Unstable Material

Where unstable material is encountered in the bottom of the trench, such material shall be removed to the depth directed and replaced to the proper grade with select granular material as provided in paragraph BACKFILLING AND COMPACTION. When removal of unstable material is required due to the Contractor's fault or neglect in performing the work, the resulting material shall be excavated and replaced by the Contractor without additional cost to the Government.

#### 3.1.1.4 Excavation for Appurtenances

Excavation for manholes, catch-basins, inlets, or similar structures shall be sufficient to leave at least 12 inches clear between the outer structure surfaces and the face of the excavation or support members. Rock shall be cleaned of loose debris and cut to a firm surface either level, stepped, or serrated, as shown or as directed. Loose disintegrated rock and thin strata shall be removed. Removal of unstable material shall be as specified above. When concrete or masonry is to be placed in an excavated area, special care shall be taken not to disturb the bottom of the excavation. Excavation to the final grade level shall not be made until just before the concrete or masonry is to be placed.

#### 3.1.1.5 Jacking, Boring, and Tunneling

Unless otherwise indicated, excavation shall be by open cut except that sections of a trench may be jacked, bored, or tunneled if, in the opinion of the Contracting Officer, the pipe, cable, or duct can be safely and properly installed and backfill can be properly compacted in such sections.

#### 3.1.2 Stockpiles

Stockpiles of satisfactory and wasted materials shall be placed and graded as specified. Stockpiles shall be kept in a neat and well drained condition, giving due consideration to drainage at all times. The ground surface at stockpile locations shall be cleared, grubbed, and sealed by rubber-tired equipment, excavated satisfactory and unsatisfactory materials shall be separately stockpiled. Stockpiles of satisfactory materials shall be protected from contamination which may destroy the quality and fitness of the stockpiled material. If the Contractor fails to protect the stockpiles, and any material becomes unsatisfactory, such material shall be removed and replaced with satisfactory material from approved sources at no additional cost to the Government.

### 3.2 BACKFILLING AND COMPACTION

Backfill material shall consist of satisfactory material, select granular material, or initial backfill material as required. Backfill shall be placed in layers not exceeding 6 inches loose thickness for compaction by hand operated machine compactors, and 8 inches loose thickness for other than hand operated machines, unless otherwise specified. Each layer shall be compacted to at least 95 percent maximum density for cohesionless soils and 90 percent maximum density for cohesive soils, unless otherwise specified.

#### 3.2.1 Trench Backfill

Trenches shall be backfilled to the grade shown.

##### 3.2.1.1 Replacement of Unyielding Material

Unyielding material removed from the bottom of the trench shall be replaced with select granular material or initial backfill material.

##### 3.2.1.2 Replacement of Unstable Material

Unstable material removed from the bottom of the trench or excavation shall be replaced with select granular material placed in layers not exceeding 6 inches loose thickness.

##### 3.2.1.3 Bedding and Initial Backfill

Bedding shall be of the type and thickness shown. Initial backfill material shall be placed and compacted with approved tampers to a height of at least 12 inches above the utility pipe or conduit. The backfill shall be brought up evenly on both sides of the pipe for the full length of the pipe. Care shall be taken to ensure thorough compaction of the fill under the haunches of the pipe.

##### 3.2.1.4 Final Backfill

The remainder of the trench, except for special materials for roadways, railroads and airfields, shall be filled with satisfactory material. Backfill material shall be placed and compacted as follows:

- a. Roadways, Railroads, and Airfields: Backfill shall be placed up to the elevation at which the requirements in Section 02300 EARTHWORK control. Water flooding or jetting methods of compaction will not be permitted.
- b. Sidewalks, Turfed or Seeded Areas and Miscellaneous Areas: Backfill shall be deposited in layers of a maximum of 12 inches loose thickness, and compacted to 85 percent maximum density for cohesive soils and 90 percent maximum density for cohesionless soils. Compaction by water flooding or jetting will not be permitted. This requirement shall also apply to all other areas not specifically designated above.

#### 3.2.2 Backfill for Appurtenances

After the manhole, catchbasin, inlet, or similar structure has been constructed and the concrete has been allowed to cure for 7 days, backfill

shall be placed in such a manner that the structure will not be damaged by the shock of falling earth. The backfill material shall be deposited and compacted as specified for final backfill, and shall be brought up evenly on all sides of the structure to prevent eccentric loading and excessive stress.

### 3.3 SPECIAL REQUIREMENTS

Special requirements for both excavation and backfill relating to the specific utilities are as follows:

#### 3.3.1 Water Lines

Trenches shall be of a depth to provide a minimum cover of 36.0 inches from the existing ground surface, or from the indicated finished grade, whichever is lower, to the top of the pipe.

#### 3.3.2 Plastic Marking Tape

Warning tapes shall be installed directly above the pipe, at a depth of 18 inches below finished grade unless otherwise shown.

### 3.4 TESTING

Testing shall be the responsibility of the Contractor and shall be performed at no additional cost to the Government.

#### 3.4.1 Testing Facilities

Tests shall be performed by an approved commercial testing laboratory or may be tested by facilities furnished by the Contractor. No work requiring testing will be permitted until the facilities have been inspected and approved by the Contracting Officer.

#### 3.4.2 Testing of Backfill Materials

Classification of backfill materials shall be determined in accordance with ASTM D 2487 and the moisture-density relations of soils shall be determined in accordance with ASTM D 1557. A minimum of one soil classification and one moisture-density relation test shall be performed on each different type of material used for bedding and backfill.

#### 3.4.3 Field Density Tests

Tests shall be performed in sufficient numbers to ensure that the specified density is being obtained. A minimum of one field density test per lift of backfill for every 164 feet of installation shall be performed. One moisture density relationship shall be determined for every 1500 cubic yards of material used. Field in-place density shall be determined in accordance with ASTM D 1556 and ASTM D 2167. Copies of calibration curves, results of calibration tests, and field and laboratory density tests shall be furnished to the Contracting Officer. Trenches improperly compacted shall be reopened to the depth directed, then refilled and compacted to the density specified at no additional cost to the Government.

#### 3.4.4 Displacement of Sewers

After other required tests have been performed and the trench backfill compacted to the finished grade surface, the pipe shall be inspected to

determine whether significant displacement has occurred. This inspection shall be conducted in the presence of the Contracting Officer. Pipe sizes larger than shall be entered and examined, while smaller diameter pipe shall be inspected by shining a light or laser between manholes or manhole locations, or by the use of television cameras passed through the pipe. If, in the judgement of the Contracting Officer, the interior of the pipe shows poor alignment or any other defects that would cause improper functioning of the system, the defects shall be remedied as directed at no additional cost to the Government.

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SECTION 02370

SOIL SURFACE EROSION CONTROL

**03/00**

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SECTION 02370

SOIL SURFACE EROSION CONTROL  
**03/00**

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 1777	(1996) Thickness of Textile Materials
ASTM D 3776	(1996) Mass per Unit Area (Weight) of Fabric
ASTM D 3787	(1989) Burst Strength of Knitted Goods: Constant-Rate-of-Traverse (CRT), Ball Burst Test
ASTM D 3884	(1992) Test Method for Abrasion Resistance of Textile Fabrics (Rotary Platform, Double Head Method)
ASTM D 4355	(1992) Deterioration of Geotextiles From Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus)
ASTM D 4491	(1999) Water Permeability of Geotextiles by Permittivity
ASTM D 4533	(1991; R 1996) Trapezoidal Tearing Strength of Geotextiles
ASTM D 4632	(1991; R 1996) Grab Breaking Load and Elongation of Geotextiles
ASTM D 4751	(1999) Determining Apparent Opening Size of a Geotextile
ASTM D 4833	(1998; R 1996e1) Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products
ASTM D 4972	(1995a) pH of Soils
ASTM D 5268	(1996) Topsoil Used for Landscaping Purposes

1.2 DESCRIPTION OF WORK

The work shall consist of furnishing and installing soil surface erosion control materials, including fine grading, blanketing, stapling, mulching

and miscellaneous related work, within project limits and in areas outside the project limits where the soil surface is disturbed from work under this contract at the designated locations. This work shall include all necessary materials, labor, supervision and equipment for installation of a complete system. This section shall be coordinated with the requirements of Section 02300 EARTHWORK.

### 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

#### SD-02 Shop Drawings

Layout  
Obstructions Below Ground  
Erosion Control; G

Scale drawings defining areas to receive recommended materials as required by federal, state or local regulations.

Calendar time period for the seed establishment period. When there is more than one seed establishment period, the boundaries of the seeded area covered for each period shall be described.

#### SD-03 Product Data

Geotextile Fabrics; G

Manufacturer's literature including physical characteristics, application and installation instructions.

#### SD-04 Samples

Materials; G

a.  
Geotextile fabrics; .

### 1.4 DELIVERY, INSPECTION, STORAGE, AND HANDLING

Materials shall be stored in designated areas and as recommended by the manufacturer protected from the elements, direct exposure, and damage. Containers shall not be dropped from trucks. Material shall be free of defects that would void required performance or warranty. Geosynthetic binders and synthetic soil binders shall be delivered in the manufacturer's original sealed containers and stored in a secure area.

- a. Erosion control blankets and geotextile fabric shall be furnished in rolls with suitable wrapping to protect against moisture and extended ultraviolet exposure prior to placement. Erosion control blanket and geotextile fabric rolls shall be labeled to provide identification sufficient for inventory and quality control purposes.

### 1.5 SUBSTITUTIONS

Substitutions will not be allowed without written request and approval from the Contracting Officer.

#### 1.6 WARRANTY

Erosion control material shall have a warranty for use and durable condition for project specific installations. Temporary erosion control materials shall carry a minimum eighteen month warranty. Permanent erosion control materials shall carry a minimum three year warranty. PART 2  
PRODUCTS

#### 2.1 GEOTEXTILE FABRICS

Geotextile fabrics shall be woven of polypropylene filaments formed into a stable network so that the filaments retain their relative position to each other. Sewn seams shall have strength equal to or greater than the geotextile itself. Fabric shall be installed to withstand maximum velocity flows as recommended by the manufacturer. The geotextile shall conform to the following minimum average roll values:

Property	Performance	Test Method
Weight		ASTM D 3776
Thickness		ASTM D 1777
Permeability		ASTM D 4491
Abrasion Resistance,	58 percent X	
Type (percent strength	81 percent	ASTM D 3884
retained)		
Tensile Grab Strength	1,467 N X 1,	ASTM D 4632
	933 N	
Grab Elongation	15percent X	ASTM D 4632
	20percent	
Burst Strength	5,510 kN/m <sup>2</sup>	ASTM D 3787
Puncture Strength	733 N	ASTM D 4833
Trapezoid Tear	533 N X 533 N	ASTM D 4533
Apparent Opening Size	40 US Std Sieve	ASTM D 4751
UV Resistance @ 500 hrs	90 percent	ASTM D 4355

#### 2.2 WATER

Unless otherwise directed, water shall be the responsibility of the Contractor. Water shall be potable or supplied by an existing irrigation system. PART 3 EXECUTION

#### 3.1 CONDITIONS

The Contractor shall submit a construction work sequence schedule, with the state or local government approved erosion control plan a minimum of 30 days prior to start of construction. The work schedule shall coordinate the timing of land disturbing activities with the provision of erosion control measures. Erosion control operations shall be performed under favorable weather conditions; when excessive moisture, frozen ground or other unsatisfactory conditions prevail, the work shall be stopped as directed. When special conditions warrant a variance to earthwork operations, a revised construction schedule shall be submitted for approval. Erosion control materials shall not be applied in adverse weather conditions which could affect their performance.

##### 3.1.1 Finished Grade

The Contractor shall verify that finished grades are as indicated on the drawings; finish grading and compaction shall be completed in accordance with Section 02300 "Earthwork", prior to the commencement of the work. The location of underground utilities and facilities in the area of the work shall be verified and marked. Damage to underground utilities and facilities shall be repaired at the Contractor's expense.

### 3.2 SITE PREPARATION

#### 3.2.1 Soil Test

Soil shall be tested in accordance with ASTM D 5268 and ASTM D 4972 for determining the particle size and mechanical analysis. Sample collection onsite shall be random over the entire site. The test shall determine the soil particle size as compatible for the specified material.

#### 3.2.2 Layout

Erosion control material locations may be adjusted to meet field conditions. When soil tests result in unacceptable particle sizes, a shop drawing shall be submitted indicating the corrective measures.

#### 3.2.3 Protecting Existing Vegetation

When there are established lawns in the work area, the turf shall be covered and/or protected or replaced after construction operations. Existing trees, shrubs, and plant beds that are to be preserved shall be barricaded along the dripline. Damage to existing trees shall be mitigated by the Contractor at no additional cost to the Government. Damage shall be assessed by a state certified arborist or other approved professional using the National Arborist Association's tree valuation guideline.

#### 3.2.4 Obstructions Below Ground

When obstructions below ground affect the work, shop drawings showing proposed adjustments to placement of erosion control material shall be submitted for approval.

### 3.3 CLEAN-UP

Excess material, debris, and waste materials shall be disposed offsite at an approved landfill or recycling center. Adjacent paved areas shall be cleared. Immediately upon completion of the installation in an area, the area shall be protected against traffic or other use by erecting barricades and providing signage as required, or as directed.

### 3.4 WATERING SOD

Water shall be applied to supplement rainfall at a sufficient rate to ensure moist soil conditions to a minimum 1 inch depth. Run-off and puddling shall be prevented. Watering trucks shall not be driven over turf areas, unless otherwise directed. Watering of other adjacent areas or plant material shall be prevented.

### 3.5 MAINTENANCE RECORD

A record shall be furnished describing the maintenance work performed, record of measurements and findings for product failure, recommendations

for repair, and products replaced.

### 3.5.1 Maintenance

Maintenance shall include eradicating weeds; protecting embankments and ditches from surface erosion; maintaining the performance of the erosion control materials and mulch; protecting installed areas from traffic.

#### 3.5.1.1 Maintenance Instructions

Written instructions containing drawings and other necessary information shall be furnished, describing the care of the installed material; including, when and where maintenance should occur, and the procedures for material replacement.

#### 3.5.1.2 Patching and Replacement

Unless otherwise directed, material shall be placed, seamed or patched as recommended by the manufacturer. Material not meeting the required performance as a result of placement, seaming or patching shall be removed from the site. The Contractor shall replace the unacceptable material at no additional cost to the Government.

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SECTION 02510

WATER DISTRIBUTION SYSTEM

04/98

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 1784	(1999a) Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
ASTM D 1785	(1999) Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
ASTM D 2241	(1996b) Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
ASTM D 2464	(1999) Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D 2466	(1999) Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40
ASTM D 2467	(1999) Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D 2564	(1996a) Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems
ASTM D 2855	(1996) Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings

ASME INTERNATIONAL (ASME)

ASME B1.20.1	(1983; R 1992) Pipe Threads, General Purpose (Inch)
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AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA B300	(1992) Hypochlorites
AWWA B301	(1992) Liquid Chlorine
AWWA C104	(1995) Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
AWWA C110	(1993) Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In., for Water and Other Liquids

AWWA C111	(1995) Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA C115	(1996) Flanged Ductile-Iron Pipe With Ductile-Iron or Gray-Iron Threaded Flanges
AWWA C151	(1996) Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids
AWWA C153	(1994; Errata Nov 1996) Ductile-Iron Compact Fittings, 3 In. Through 24 In. and 54 In. through 64 In. for Water Service
AWWA C500	(1993; C500a) Metal-Sealed Gate Valves for Water Supply Service
AWWA C502	(1994; C502a) Dry-Barrel Fire Hydrants
AWWA C509	(1994; Addendum 1995) Resilient-Seated Gate Valves for Water Supply Service
AWWA C600	(1993) Installation of Ductile-Iron Water Mains and Their Appurtenances
AWWA C606	(1997) Grooved and Shouldered Joints
AWWA C703	(1996) Cold-Water Meters - Fire Service Type
AWWA C704	(1992) Propeller-Type Meters Waterworks Applications
AWWA C706	(1996) Direct-Reading, Remote-Registration Systems for Cold-Water Meters
AWWA C800	(1989) Underground Service Line Valves and Fittings
AWWA C900	(1997; C900a) Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. Through 12 In., for Water Distribution
AWWA C905	(1997) Polyvinyl Chloride (PVC) Water Transmission Pipe, Nominal Diameters 14 In. Through 36 In.
AWWA M23	(1980) Manual: PVC Pipe - Design and Installation

DUCTILE IRON PIPE RESEARCH ASSOCIATION (DIPRA)

DIPRA-Restraint Design	(1997) Thrust Restraint Design for Ductile Iron Pipe
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MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS  
INDUSTRY (MSS)

MSS SP-80	(1997) Bronze Gate, Globe, Angle and Check
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## Valves

### NSF INTERNATIONAL (NSF)

NSF 14	(1998) Plastics Piping Components and Related Materials
NSF 61	(1999) Drinking Water System Components - Health Effects (Sections 1-9)

## 1.2 PIPING

This section covers water supply and service lines, and connections to building service at a point approximately 5 feet outside buildings and structures to which service is required. The Contractor shall have a copy of the manufacturer's recommendations for each material or procedure to be utilized available at the construction site at all times.

### 1.2.1 Service Lines

Piping for water service lines less than 3 inches in diameter shall be polyvinyl chloride (PVC) plastic, unless otherwise shown or specified. Piping for water service lines 3 inches and larger shall be ductile iron, polyvinyl chloride (PVC) plastic, unless otherwise shown or specified.

### 1.2.2 Supply Lines 3 Inches or Larger

Piping for water supply lines 3 inches or larger shall be polyvinyl chloride (PVC) plastic, through 35.5 inches nominal diameter, unless otherwise shown or specified.

### 1.2.3 Potable Water Lines

Piping and components of potable water systems which come in contact with the potable water shall conform to NSF 61.

### 1.2.4 Plastic Piping System

Plastic piping system components (PVC) intended for transportation of potable water shall comply with NSF 14 and be legibly marked with their symbol.

### 1.2.5 Excavation, Trenching, and Backfilling

Excavation, trenching, and backfilling shall be in accordance with the applicable provisions of Section 02316 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS, except as modified herein.

## 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Installation; G.

The manufacturer's recommendations for each material or procedure to be utilized.

Satisfactory Installation; G.

A statement signed by the principal officer of the contracting firm stating that the installation is satisfactory and in accordance with the contract drawings and specifications, and the manufacturer's prescribed procedures and techniques, upon completion of the project and before final acceptance.

#### SD-06 Test Reports

Bacteriological Disinfection; G.

Test results from commercial laboratory verifying disinfection.

### 1.4 HANDLING

Pipe and accessories shall be handled to ensure delivery to the trench in sound, undamaged condition, including no injury to the pipe coating or lining. If the coating or lining of any pipe or fitting is damaged, the repair shall be made by the Contractor in a satisfactory manner, at no additional cost to the Government. No other pipe or material shall be placed inside a pipe or fitting after the coating has been applied. Pipe shall be carried into position and not dragged. Use of pinch bars and tongs for aligning or turning pipe will be permitted only on the bare ends of the pipe. The interior of pipe and accessories shall be thoroughly cleaned of foreign matter before being lowered into the trench and shall be kept clean during laying operations by plugging or other approved method. Before installation, the pipe shall be inspected for defects. Material found to be defective before or after laying shall be replaced with sound material without additional expense to the Government. Rubber gaskets that are not to be installed immediately shall be stored in a cool and dark place.

#### 1.4.1 Miscellaneous Plastic Pipe and Fittings

Polyvinyl Chloride (PVC), and fittings shall be handled and stored in accordance with the manufacturer's recommendations. Storage facilities shall be classified and marked in accordance with NFPA 704, with classification as indicated in NFPA 49 and NFPA 325-1.

## PART 2 PRODUCTS

### 2.1 PIPE

Pipe shall conform to the respective specifications and other requirements specified below.

#### 2.1.1 Plastic Pipe

##### 2.1.1 PVC Plastic Pipe

Pipe, couplings and fittings shall be manufactured of material conforming to ASTM D 1784, Class 12454B.

a. Pipe Less Than Diameter:

(1) Screw-Joint: Pipe shall conform to dimensional requirements of ASTM D 1785 Schedule 80, with joints meeting requirements of 150 psi working pressure, 200 psi hydrostatic test pressure, unless otherwise shown or specified. Pipe couplings when used, shall be tested as required by ASTM D 2464.

(2) Elastomeric-Gasket Joint: Pipe shall conform to dimensional requirements of ASTM D 1785 Schedule 40, with joints meeting the requirements of 150 psi working pressure, 200 psi hydrostatic test pressure, unless otherwise shown or specified, or it may be pipe conforming to requirements of ASTM D 2241, elastomeric joint, with the following applications:

SDR	Maximum Working Pressure psi	Minimum Hydrostatic Pressure psi
26	100	133
21	120	160
17	150	200
13.5	200	266

(3) Solvent Cement Joint: Pipe shall conform to dimensional requirements of ASTM D 1785 or ASTM D 2241 with joints meeting the requirements of 150 psi working pressure and 200 psi hydrostatic test pressure.

- b. Pipe 4 through 12 inches Diameter: Pipe, couplings and fittings shall conform to AWWA C900, Class 150, CIOD pipe dimensions, elastomeric-gasket joint, unless otherwise shown or specified.
- c. Pipe 14 through 27.5 inches Diameter: Pipe shall conform to AWWA C905 unless otherwise shown or specified.

#### 2.1.2 Ductile-Iron Pipe

Ductile-iron pipe shall conform to AWWA C151, working pressure not less than 150 psi, unless otherwise shown or specified. Pipe shall be cement-mortar lined in accordance with AWWA C104. Linings shall be standard. Flanged ductile iron pipe with threaded flanges shall be in accordance with AWWA C115.

### 2.2 FITTINGS AND SPECIALS

#### 2.2.1 PVC Pipe System

- a. For pipe less than diameter, fittings for threaded pipe shall conform to requirements of ASTM D 2464, threaded to conform to the requirements of ASME B1.20.1 for use with Schedule 80 pipe and fittings; fittings for solvent cement jointing shall conform to ASTM D 2466 or ASTM D 2467; and fittings for elastomeric-gasket joint pipe shall be iron conforming to AWWA C110 or AWWA C111. Iron fittings and specials shall be cement-mortar lined (standard thickness) in accordance with AWWA C104.
- b. For pipe diameter and larger, fittings and specials shall be iron, bell end in accordance with AWWA C110, 150 psi pressure rating

unless otherwise shown or specified, except that profile of bell may have special dimensions as required by the pipe manufacturer; or fittings and specials may be of the same material as the pipe with elastomeric gaskets, all in conformance with AWWA C900. Iron fittings and specials shall be cement-mortar lined (standard thickness) in accordance with AWWA C104. Fittings shall be bell and spigot or plain end pipe, or as applicable. Ductile iron compact fittings shall be in accordance with AWWA C153.

#### 2.2.2 Ductile-Iron Pipe System

Fittings and specials shall be suitable for 150 psi pressure rating, unless otherwise specified. Fittings and specials for mechanical joint pipe shall conform to AWWA C110. Fittings and specials for use with push-on joint pipe shall conform to AWWA C110 and AWWA C111. Fittings and specials for grooved and shouldered end pipe shall conform to AWWA C606. Fittings and specials shall be cement-mortar lined (standard thickness) in accordance with AWWA C104. Ductile iron compact fittings shall conform to AWWA C153.

### 2.3 JOINTS

#### 2.3.1 Plastic Pipe Jointing

##### 2.3.1.1 PVC Pipe

Joints, fittings, and couplings shall be as specified for PVC pipe. Joints connecting pipe of differing materials shall be made in accordance with the manufacturer's recommendations, and as approved by the Contracting Officer.

#### 2.3.2 Ductile-Iron Pipe Jointing

- a. Mechanical joints shall be of the stuffing box type and shall conform to AWWA C111.
- b. Push-on joints shall conform to AWWA C111.
- c. Rubber gaskets and lubricants shall conform to the applicable requirements of AWWA C111.

#### 2.3.3 Bonded Joints

Where indicated, a metallic bond shall be provided at each joint, including joints made with flexible couplings, caulking, or rubber gaskets, of ferrous metallic piping to effect continuous conductivity. The bond wire shall be Size 1/0 copper conductor suitable for direct burial shaped to stand clear of the joint. The bond shall be of the thermal weld type.

### 2.4 VALVES

#### 2.4.1 Gate Valves

Gate valves shall be designed for a working pressure of not less than 150 psi. Valve connections shall be as required for the piping in which they are installed. Valves shall have a clear waterway equal to the full nominal diameter of the valve, and shall be opened by turning counterclockwise. The operating nut or wheel shall have an arrow, cast in the metal, indicating the direction of opening.

- a. Valves smaller than shall be all bronze and shall conform to MSS SP-80, Type 1, Class 150.
- b. Valves and larger shall be iron body, bronze mounted, and shall conform to AWWA C500. Flanges shall not be buried. An approved pit shall be provided for all flanged connections.
- c. Resilient-Seated Gate Valves: For valves in size, resilient-seated gate valves shall conform to AWWA C509.

## 2.5 VALVE BOXES

Valve boxes shall be cast iron or concrete, except that concrete boxes may be installed only in locations not subjected to vehicular traffic. Cast-iron boxes shall be extension type with slide-type adjustment and with flared base. The minimum thickness of metal shall be .5 inch. Concrete boxes shall be the standard product of a manufacturer of precast concrete equipment. The word "WATER" shall be cast in the cover. The box length shall adapt, without full extension, to the depth of cover required over the pipe at the valve location.

## 2.6 FIRE HYDRANTS

Hydrants shall be dry-barrel type conforming to AWWA C502 with valve opening at least in diameter and designed so that the flange at the main valve seat can be removed with the main valve seat apparatus remaining intact, closed and reasonably tight against leakage and with a breakable valve rod coupling and breakable flange connections located no more than 8 inches above the ground grade. Hydrants shall have a 6 inches bell connection, two 2.5 inches hose connections and one 4.5 inches pumper connection. Outlets shall have American National Standard fire-hose coupling threads. Working parts shall be bronze. Design, material, and workmanship shall be equal to the latest stock pattern ordinarily produced by the manufacturer. Hydrants shall be painted with 1 coat of red iron oxide, zinc oxide primer conforming to SSPC Paint 25 and 2 finish coats of silicone alkyd paint conforming to SSPC Paint 21, of the installation's standard colors or as directed by the Contracting Officer.

## 2.7 MISCELLANEOUS ITEMS

### 2.7.1 Service Clamps

Service clamps shall have a pressure rating not less than that of the pipe to be connected and shall be either the single or double flattened strap type. Clamps shall have a galvanized malleable-iron body with cadmium plated straps and nuts. Clamps shall have a rubber gasket cemented to the body.

### 2.7.2 Corporation Stops

Corporation stops shall have standard corporation stop thread conforming to AWWA C800 on the inlet end, with flanged joints, compression pattern flared tube couplings, or wiped joints for connections to goosenecks.

### 2.7.3 Goosenecks

Copper tubing for gooseneck connections shall conform to the applicable requirements of ASTM B 88, Type K, annealed. Length of cable requirement

connections shall be in accordance with standard practice.

#### 2.7.4 Service Stops

Service stops shall be water-works inverted-ground-key type, oval or round flow way, tee handle, without drain. Pipe connections shall be suitable for the type of service pipe used. All parts shall be of bronze with female iron-pipe-size connections or compression-pattern flared tube couplings, and shall be designed for a hydrostatic test pressure not less than 200 psi.

#### 2.7.5 Tapping Sleeves

Tapping sleeves of the sizes indicated for connection to existing main shall be the cast gray, ductile, or malleable iron, split-sleeve type with flanged or grooved outlet, and with bolts, follower rings and gaskets on each end of the sleeve. Construction shall be suitable for a maximum working pressure of 150 psi. Bolts shall have square heads and hexagonal nuts. Longitudinal gaskets and mechanical joints with gaskets shall be as recommended by the manufacturer of the sleeve. When using grooved mechanical tee, it shall consist of an upper housing with full locating collar for rigid positioning which engages a machine-cut hole in pipe, encasing an elastomeric gasket which conforms to the pipe outside diameter around the hole and a lower housing with positioning lugs, secured together during assembly by nuts and bolts as specified, pretorqued to 50 foot-pound.

#### 2.7.6 Service Boxes

Service boxes shall be cast iron or concrete and shall be extension service boxes of the length required for the depth of the line, with either screw or slide-type adjustment. The boxes shall have housings of sufficient size to completely cover the service stop or valve and shall be complete with identifying covers.

#### 2.7.7 Disinfection

Chlorinating materials shall conform to the following:

Chlorine, Liquid: AWWA B301.

Hypochlorite, Calcium and Sodium: AWWA B300.

#### 2.7.8 Meters

Meters shall be the type and size shown on the drawings or specified. Meters of each of the various types furnished and installed shall be supplied by one manufacturer.

##### 2.7.8.1 Propeller Type

Propeller type meters shall conform to AWWA C704. Registers shall be straight-reading type, shall be open and shall read in U.S. gallons. Connections shall be suitable to the type of pipe and conditions encountered. Register type shall be a direct-reading remote register designed in accordance with AWWA C706. Meters shall comply with the accuracy and capacity requirements of AWWA C703.

#### 2.7.9 Meter Boxes



Meter boxes shall be of cast iron, concrete, or plastic. The boxes shall be of sufficient size to completely enclose the meter and shutoff valve or service stop. Meter boxes set in paved areas subject to vehicular traffic shall be cast iron, or concrete with cast iron lid and cast iron meter reader lid. Boxes set in sidewalks, not subject to vehicular traffic, shall be concrete with cast iron lid and cast iron meter reader lid. Plastic boxes and lids shall not be used in unpaved areas or grass areas not subject to vehicular traffic. Box height shall extend from invert of the meter to final grade at the meter location. The lid shall have the word "WATER" cast in it.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

##### 3.1.1 Cutting of Pipe

Cutting of pipe shall be done in a neat and workmanlike manner without damage to the pipe. Unless otherwise recommended by the manufacturer and authorized by the Contracting Officer, cutting shall be done with an approved type mechanical cutter. Wheel cutter shall be used when practicable. Copper tubing shall be cut square and all burrs shall be removed. Squeeze type mechanical cutters shall not be used for ductile iron.

##### 3.1.2 Adjacent Facilities

###### 3.1.2.1 Sewer Lines

Where the location of the water pipe is not clearly defined in dimensions on the drawings, the water pipe shall not be laid closer horizontally than 10 feet from a sewer except where the bottom of the water pipe will be at least 12 inches above the top of the sewer pipe, in which case the water pipe shall not be laid closer horizontally than 6 feet from the sewer. Where water lines cross under gravity-flow sewer lines, the sewer pipe, for a distance of at least 10 feet each side of the crossing, shall be fully encased in concrete or shall be made of pressure pipe with no joint located within 1 meter horizontally of the crossing. Water lines shall in all cases cross above sewage force mains or inverted siphons and shall be not less than above the sewer main. Joints in the sewer main, closer horizontally than 3.5 feet to the crossing, shall be encased in concrete.

###### 3.1.2.2 Water Lines

Water lines shall not be laid in the same trench with sewer lines, gas lines, fuel lines, or electric wiring.

##### 3.1.3 Joint Deflection

###### 3.1.3.1 Offset for Flexible Plastic Pipe

Maximum offset in alignment between adjacent pipe joints shall be as recommended by the manufacturer and approved by the Contracting Officer, but shall not exceed 5 degrees.

###### 3.1.3.2 Allowable for Ductile-Iron Pipe

The maximum allowable deflection shall be as given in AWWA C600. If the alignment requires deflection in excess of the above limitations, special

bends or a sufficient number of shorter lengths of pipe shall be furnished to provide angular deflections within the limit set forth.

#### 3.1.4 Placing and Laying

Pipe and accessories shall be carefully lowered into the trench by means of derrick, ropes, belt slings, or other authorized equipment. Water-line materials shall not be dropped or dumped into the trench. Abrasion of the pipe coating shall be avoided. Except where necessary in making connections with other lines or as authorized by the Contracting Officer, pipe shall be laid with the bells facing in the direction of laying. The full length of each section of pipe shall rest solidly upon the pipe bed, with recesses excavated to accommodate bells, couplings, and joints. Pipe that has the grade or joint disturbed after laying shall be taken up and relaid. Pipe shall not be laid in water or when trench conditions are unsuitable for the work. Water shall be kept out of the trench until joints are complete. When work is not in progress, open ends of pipe, fittings, and valves shall be securely closed so that no trench water, earth, or other substance will enter the pipes or fittings. Where any part of the coating or lining is damaged, the repair shall be made by and at the Contractor's expense in a satisfactory manner. Pipe ends left for future connections shall be valved, plugged, or capped, and anchored, as shown.

##### 3.1.4.1 Plastic Pipe Installation

PVC pipe shall be installed in accordance with AWWA M23.

##### 3.1.4.2 Piping Connections

Where connections are made between new work and existing mains, the connections shall be made by using specials and fittings to suit the actual conditions. When made under pressure, these connections shall be installed using standard methods as approved by the Contracting Officer.

##### 3.1.4.3 Tracer Wire

Tracer wire shall be required for all plastic pipe installation.

- A. Locator Wire is to be standard No. 12 gauge coated copper wire.
- B. Bury locator wire immediately above pipe.
- C. Location wire connections are to be a water tight connection. This may be done by using Twister DP Plus Waterproof wire connectors or an approved equal.
- D. The cost for this tracer wire shall not be paid for directly but shall be considered incidental to cost of water main installation.
- E. Five feet of tracer wire shall be pulled into each in-line valve box in a manner not to cause any operational problems with the valve nor causing breaks in the locator wire.

##### 3.1.4.4 Penetrations

Pipe passing through walls of valve pits and structures shall be provided with ductile-iron or Schedule 40 steel wall sleeves. Annular space between walls and sleeves shall be filled with rich cement mortar. Annular space between pipe and sleeves shall be filled with mastic.

#### 3.1.5 Jointing

##### 3.1.5.1 PVC Plastic Pipe Requirements

- a. Pipe less than diameter: Threaded joints shall be made by wrapping the male threads with approved thread tape or applying an approved lubricant, then threading the joining members together. The joint shall be tightened using strap wrenches to prevent damage to the pipe and/or fitting. To avoid excessive torque, joints shall be tightened no more than one thread past hand-tight. Preformed rubber-ring gaskets for elastomeric-gasket joints shall be made in accordance with ASTM F 477 and as specified. Pipe ends for push-on joints shall be beveled to facilitate assembly and marked to indicate when the pipe is fully seated. The gasket shall be prelubricated to prevent displacement. The gasket and ring groove in the bell or coupling shall match. The manufacturer of the pipe or fitting shall supply the elastomeric gasket. Couplings shall be provided with stops or centering rings to assure that the coupling is centered on the joint. Solvent cement joints shall use sockets conforming to ASTM D 2467. The solvent cement used shall meet the requirements of ASTM D 2564; the joint assembly shall be made in accordance with ASTM D 2855 and the manufacturer's specific recommendations.
- b. Pipe 4 through 12 inches diameter: Joints shall be elastomeric gasket as specified in AWWA C900. Jointing procedure shall be as specified for pipe less than 100 mm diameter with configuration using elastomeric ring gasket.
- c. Pipe diameter: Joints shall be elastomeric gasket push-on joints made in accordance with AWWA M23.

#### 3.1.5.2 Ductile-Iron Pipe Requirements

Mechanical and push-on type joints shall be installed in accordance with AWWA C600 for buried lines or AWWA C606 for grooved and shouldered pipe above ground or in pits.

#### 3.1.5.3 Transition Fittings

Connections between different types of pipe and accessories shall be made with transition fittings approved by the Contracting Officer.

#### 3.1.6 Installation of Service Lines

Service lines shall include the pipeline connecting building piping to water distribution lines to the connections with the building service at a point approximately 5 feet outside the building where such building service exists. Where building services are not installed, the Contractor shall terminate the service lines approximately 5 feet from the site of the proposed building at a point designated by the Contracting Officer. Such service lines shall be closed with plugs or caps. All service stops and valves shall be provided with service boxes. Service lines shall be constructed in accordance with the following requirements:

##### 3.1.6.1 Service Lines 2 Inches and Smaller

Service lines 2 inches and smaller shall be connected to the main by a directly-tapped corporation stop or by a service clamp. A corporation stop and a copper gooseneck shall be provided with either type of connection. Maximum sizes for directly-tapped corporation stops and for outlets with service clamps shall be as in TABLE I. Where 2 or more gooseneck

connections to the main are required for an individual service, such connections shall be made with standard branch connections. The total clear area of the branches shall be at least equal to the clear area of the service which they are to supply.

TABLE I. SIZE OF CORPORATION STOPS AND OUTLET

Pipe Size MM	Corporation Stops, MM For Ductile-Iron Pipe	Outlets w/Service Clamps, MM Single & Double Strap
75	--	25
100	25	25
150	31.25	37.50
200	37.50	50
250	37.50	50
300 & larger	50	50

NOTE:

- a. Service lines 1.5 inches and smaller shall have a service stop.
- b. Service lines 2 inches in size shall have a gate valve.

3.1.6.2 Service Lines Larger than 2 Inches

Service lines larger than 2 inches shall be connected to the main by a tapped saddle, tapping sleeve and valve, service clamp or reducing tee, depending on the main diameter and the service line diameter, and shall have a gate valve. Lines .5 inches and larger may use rubber-seated butterfly valves as specified above, or gate valves.

3.1.6.3 Service Lines for Sprinkler Supplies

Water service lines used to supply building sprinkler systems for fire protection shall be connected to the water distribution main in accordance with NFPA 24.

3.1.7 Setting of Fire Hydrants, Meters, Valves and Valve Boxes

3.1.7.1 Location of Fire Hydrants

Fire hydrants shall be located and installed as shown. Each hydrant shall be connected to the main with a 6 inches branch line having at least as much cover as the distribution main. Hydrants shall be set plumb with pumper nozzle facing the roadway, with the center of the lowest outlet not less than 18 inches above the finished surrounding grade, and the operating nut not more than 4 feet above the finished surrounding grade. Fire hydrants designated on the drawings as low profile shall have the lowest outlet not less than 18 inches above the finished surrounding grade, the top of the hydrant not more than 23.5 inches above the finished surrounding grade. Except where approved otherwise, the backfill around hydrants shall be thoroughly compacted to the finished grade immediately after

installation to obtain beneficial use of the hydrant as soon as practicable. The hydrant shall be set upon a slab of concrete not less than 4 inches thick and 15 inches square. Not less than 2.25 cubic meters of free-draining broken stone or gravel shall be placed around and beneath the waste opening of dry barrel hydrants to ensure drainage.

#### 3.1.7.2 Location of Meters

Meters and meter boxes shall be installed at the locations shown on the drawings. The meters shall be centered in the boxes to allow for reading and ease of removal or maintenance.

#### 3.1.7.3 Location of Valves

After delivery, valves, including those in hydrants, shall be drained to prevent freezing and shall have the interiors cleaned of all foreign matter before installation. Stuffing boxes shall be tightened and hydrants and valves shall be fully opened and fully closed to ensure that all parts are in working condition. Valves and valve boxes shall be installed where shown or specified, and shall be set plumb. Valve boxes shall be centered on the valves. Boxes shall be installed over each outside gate valve unless otherwise shown. Where feasible, valves shall be located outside the area of roads and streets. Earth fill shall be tamped around each valve box or pit to a distance of 4 feet on all sides of the box, or the undisturbed trench face if less than 1.25 meters.

#### 3.1.7.4 Location of Service Boxes

Where water lines are located below paved streets having curbs, the boxes shall be installed directly back of the curbs. Where no curbing exists, service boxes shall be installed in accessible locations, beyond the limits of street surfacing, walks and driveways.

#### 3.1.8 Tapped Tees and Crosses

Tapped tees and crosses for future connections shall be installed where shown.

#### 3.1.9 Thrust Restraint

Plugs, caps, tees and bends deflecting 11.25 degrees or more, either vertically or horizontally, on waterlines in diameter or larger, and fire hydrants shall be provided with thrust restraints. Valves shall be securely anchored or shall be provided with thrust restraints to prevent movement. Thrust restraints shall be either thrust blocks or, for ductile-iron pipes, restrained joints.

##### 3.1.9.1 Thrust Blocks

Thrust blocking shall be concrete of a mix not leaner than: 1 cement, 2-1/2 sand, 5 gravel; and having a compressive strength of not less than 2,000 psi after 28 days. Blocking shall be placed between solid ground and the hydrant or fitting to be anchored. Unless otherwise indicated or directed, the base and thrust bearing sides of thrust blocks shall be poured directly against undisturbed earth. The sides of thrust blocks not subject to thrust may be poured against forms. The area of bearing shall be as shown or as directed. Blocking shall be placed so that the fitting joints will be accessible for repair. Steel rods and clamps, protected by galvanizing or by coating with bituminous paint, shall be used to anchor

vertical down bends into gravity thrust blocks.

#### 3.1.9.2 Restrained Joints

For ductile-iron pipe, restrained joints shall be designed by the Contractor or the pipe manufacturer in accordance with DIPRA-Restraint Design.

### 3.2 HYDROSTATIC TESTS

Where any section of a water line is provided with concrete thrust blocking for fittings or hydrants, the hydrostatic tests shall not be made until at least 5 days after installation of the concrete thrust blocking, unless otherwise approved.

#### 3.2.1 Pressure Test

After the pipe is laid, the joints completed, fire hydrants permanently installed, and the trench partially backfilled leaving the joints exposed for examination, the newly laid piping or any valved section of piping shall, unless otherwise specified, be subjected for 1 hour to a hydrostatic pressure test of 200 psi. Water supply lines designated on the drawings shall be subjected for 1 hour to a hydrostatic pressure test of 200 psi. Each valve shall be opened and closed several times during the test. Exposed pipe, joints, fittings, hydrants, and valves shall be carefully examined during the partially open trench test. Joints showing visible leakage shall be replaced or remade as necessary. Cracked or defective pipe, joints, fittings, hydrants and valves discovered in consequence of this pressure test shall be removed and replaced with sound material, and the test shall be repeated until the test results are satisfactory. The requirement for the joints to remain exposed for the hydrostatic tests may be waived by the Contracting Officer when one or more of the following conditions is encountered:

- a. Wet or unstable soil conditions in the trench.
- b. Compliance would require maintaining barricades and walkways around and across an open trench in a heavily used area that would require continuous surveillance to assure safe conditions.
- c. Maintaining the trench in an open condition would delay completion of the project.

The Contractor may request a waiver, setting forth in writing the reasons for the request and stating the alternative procedure proposed to comply with the required hydrostatic tests. Backfill placed prior to the tests shall be placed in accordance with the requirements of Section 02316 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS.

#### 3.2.2 Leakage Test

Leakage test shall be conducted after the pressure tests have been satisfactorily completed. The duration of each leakage test shall be at least 2 hours, and during the test the water line shall be subjected to not less than 200 psi pressure. Water supply lines designated on the drawings shall be subjected to a pressure equal to 200 psi. Leakage is defined as the quantity of water to be supplied into the newly laid pipe, or any valved or approved section, necessary to maintain pressure within 5 psi of the specified leakage test pressure after the pipe has been filled with

water and the air expelled. Piping installation will not be accepted if leakage exceeds the allowable leakage which is determined by the following formula:

$$L = 0.0001351ND(P \text{ raised to } 0.5 \text{ power})$$

L = Allowable leakage in gallons per hour

N = Number of joints in the length of pipeline tested

D = Nominal diameter of the pipe in inches

P = Average test pressure during the leakage test, in psi gauge

Should any test of pipe disclose leakage greater than that calculated by the above formula, the defective joints shall be located and repaired until the leakage is within the specified allowance, without additional cost to the Government.

### 3.2.3 Time for Making Test

Except for joint material setting or where concrete thrust blocks necessitate a 5-day delay, pipelines jointed with rubber gaskets, mechanical or push-on joints, or couplings may be subjected to hydrostatic pressure, inspected, and tested for leakage at any time after partial completion of backfill. Cement-mortar lined pipe may be filled with water as recommended by the manufacturer before being subjected to the pressure test and subsequent leakage test.

### 3.2.4 Concurrent Hydrostatic Tests

The Contractor may elect to conduct the hydrostatic tests using either or both of the following procedures. Regardless of the sequence of tests employed, the results of pressure tests, leakage tests, and disinfection shall be as specified. Replacement, repair or retesting required shall be accomplished by the Contractor at no additional cost to the Government.

- a. Pressure test and leakage test may be conducted concurrently.
- b. Hydrostatic tests and disinfection may be conducted concurrently, using the water treated for disinfection to accomplish the hydrostatic tests. If water is lost when treated for disinfection and air is admitted to the unit being tested, or if any repair procedure results in contamination of the unit, disinfection shall be reaccomplished.

## 3.3 BACTERIALDISINFECTION

### 3.3.1 Bacteriological Disinfection

Before acceptance of potable water operation, each unit of completed waterline shall be disinfected as specified. After pressure tests have been made, the unit to be disinfected shall be thoroughly flushed with water until all entrained dirt and mud have been removed before introducing the chlorinating material. The chlorinating material shall be either liquid chlorine, calcium hypochlorite, or sodium hypochlorite, conforming to paragraph MISCELLANEOUS ITEMS. The chlorinating material shall provide a dosage of not less than 50 ppm and shall be introduced into the water lines in an approved manner. Polyvinyl Chloride (PVC) pipe lines shall be chlorinated using only the above specified chlorinating material in solution. The agent shall not be introduced into the line in a dry solid state. The treated water shall be retained in the pipe long enough to

destroy all non-spore forming bacteria. Except where a shorter period is approved, the retention time shall be at least 24 hours and shall produce not less than 25 ppm of free chlorine residual throughout the line at the end of the retention period. Valves on the lines being disinfected shall be opened and closed several times during the contact period. The line shall then be flushed with clean water until the residual chlorine is reduced to less than 1.0 ppm. During the flushing period, each fire hydrant on the line shall be opened and closed several times. From several points in the unit, personnel from the Contractor's commercial laboratory shall take at least 3 water samples from different points, approved by the Contracting Officer, in proper sterilized containers and perform a bacterial examination in accordance with state approved methods. The commercial laboratory shall be certified by the state's approving authority for examination of potable water. The disinfection shall be repeated until tests indicate the absence of pollution for at least 2 full days. The unit will not be accepted until satisfactory bacteriological results have been obtained.

#### 3.4 CLEANUP

Upon completion of the installation of water lines, and appurtenances, all debris and surplus materials resulting from the work shall be removed.

-- End of Section --



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SECTION 02722

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SECTION 02722

AGGREGATE AND/OR GRADED-CRUSHED AGGREGATE BASE COURSE  
**09/98**

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 29/C 29M	(1997) Bulk Density ("Unit Weight") and Voids in Aggregates
ASTM C 88	(1999a) Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C 117	(1995) Materials Finer Than 75 micrometer (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C 127	(1988; R 1993el) Specific Gravity and Absorption of Course Aggregate
ASTM C 128	(1997) Specific Gravity and Absorption of Fine Aggregate
ASTM C 131	(1996) Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C 136	(1996a) Sieve Analysis of Fine and Coarse Aggregates
ASTM D 75	(1987; R 1997) Sampling Aggregates
ASTM D 1556	(1990; R 1996el) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(1991; R 1998) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu.m.))
ASTM D 2167	(1994) Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D 2487	(1998) Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 4318	(1998) Liquid Limit, Plastic Limit, and Plasticity Index of Soils

ASTM E 11 (1995) Wire-Cloth Sieves for Testing  
Purposes

## 1.2 DEFINITIONS

For the purposes of this specification, the following definitions apply.

### 1.2.1 Aggregate Base Course

Aggregate base course (ABC) is well graded, durable aggregate uniformly moistened and mechanically stabilized by compaction.

### 1.2.2 Degree of Compaction

Degree of compaction shall be expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557.

## 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

### SD-03 Product Data

#### Plant, Equipment, and Tools

List of proposed equipment to be used in performance of construction work, including descriptive data.

#### Waybills and Delivery Tickets

Copies of waybills and delivery tickets during the progress of the work. Before the final statement is allowed, the Contractor shall file certified waybills and certified delivery tickets for all aggregates actually used.

### SD-06 Test Reports

#### Sampling and testing

#### Field Density Tests

Calibration curves and related test results prior to using the device or equipment being calibrated. Copies of field test results within 24 hours after the tests are performed. Certified copies of test results for approval not less than 30 days before material is required for the work.

## 1.4 SAMPLING AND TESTING

Sampling and testing shall be the responsibility of the Contractor. Sampling and testing shall be performed by a testing laboratory approved in accordance with Section 01451 CONTRACTOR QUALITY CONTROL. Work requiring testing will not be permitted until the testing laboratory has been inspected and approved. The materials shall be tested to establish compliance with the specified requirements; testing shall be performed at the specified frequency. The Contracting Officer may specify the time and

location of the tests. Copies of test results shall be furnished to the Contracting Officer within 24 hours of completion of the tests.

#### 1.4.1 Sampling

Samples for laboratory testing shall be taken in conformance with ASTM D 75. When deemed necessary, the sampling will be observed by the Contracting Officer.

#### 1.4.2 Tests

The following tests shall be performed in conformance with the applicable standards listed.

##### 1.4.2.1 Sieve Analysis

Sieve analysis shall be made in conformance with ASTM C 117 and ASTM C 136. Sieves shall conform to ASTM E 11.

##### 1.4.2.2 Liquid Limit and Plasticity Index

Liquid limit and plasticity index shall be determined in accordance with ASTM D 4318.

##### 1.4.2.3 Moisture-Density Determinations

The maximum density and optimum moisture content shall be determined in accordance with ASTM D 1557.

##### 1.4.2.4 Field Density Tests

Density shall be field measured in accordance with ASTM D 1556 ASTM D 2167.

##### 1.4.2.5 Wear Test

Wear tests shall be made on ABC course material in conformance with ASTM C 131.

##### 1.4.2.6 Soundness

Soundness tests shall be made on GCA in accordance with ASTM C 88.

#### 1.4.3 Testing Frequency

##### 1.4.3.1 Initial Tests

One of each of the following tests shall be performed on the proposed material prior to commencing construction to demonstrate that the proposed material meets all specified requirements when furnished. If materials from more than one source are going to be utilized, this testing shall be completed for each source.

- a. Sieve Analysis.
- b. Liquid limit and plasticity index moisture-density relationship.
- c. Moisture-density relationship.

- d. Wear.
- e. Soundness.

#### 1.4.3.2 In Place Tests

One of each of the following tests shall be performed on samples taken from the placed and compacted ABC. Samples shall be taken and tested at the rates indicated.

- a. Density tests shall be performed on every lift of material placed and at a frequency of one set of tests for every 250 square yards, or portion thereof, of completed area.

- b. Sieve Analysis shall be performed for every 500 tons, or portion thereof, of material placed.

- c. Liquid limit and plasticity index tests shall be performed at the same frequency as the sieve analysis.

#### 1.4.4 Approval of Material

The source of the material shall be selected 7 days prior to the time the material will be required in the work. Tentative approval of material will be based on initial test results. Final approval of the materials will be based on sieve analysis, liquid limit, and plasticity index tests performed on samples taken from the completed and fully compacted ABC.

#### 1.5 WEATHER LIMITATIONS

Construction shall be done when the atmospheric temperature is above 2 degrees C. When the temperature falls below 2 degrees C, the Contractor shall protect all completed areas by approved methods against detrimental effects of freezing. Completed areas damaged by freezing, rainfall, or other weather conditions shall be corrected to meet specified requirements.

#### 1.6 PLANT, EQUIPMENT, AND TOOLS

All plant, equipment, and tools used in the performance of the work will be subject to approval before the work is started and shall be maintained in satisfactory working condition at all times. The equipment shall be adequate and shall have the capability of producing the required compaction, meeting grade controls, thickness control, and smoothness requirements as set forth herein.

### PART 2 PRODUCTS

#### 2.1 AGGREGATES

The ABC shall consist of clean, sound, durable particles of crushed stone, crushed slag, crushed gravel, crushed recycled concrete, angular sand, or other approved material. ABC shall be free of lumps of clay, organic matter, and other objectionable materials or coatings. The portion retained on the No. 4 sieve shall be known as coarse aggregate; that portion passing the No. 4 sieve shall be known as fine aggregate.

##### 2.1.1 Coarse Aggregate

Coarse aggregates shall be angular particles of uniform density. When the coarse aggregate is supplied from more than one source, aggregate from each source shall meet the specified requirements and shall be stockpiled separately.

a. Crushed Gravel: Crushed gravel shall be manufactured by crushing gravels, and shall meet all the requirements specified below.

b. Crushed Stone: Crushed stone shall consist of freshly mined quarry rock, and shall meet all the requirements specified below.

c. Crushed Recycled Concrete: Crushed recycled concrete shall consist of previously hardened portland cement concrete or other concrete containing pozzolanic binder material. The recycled material shall be free of all reinforcing steel, bituminous concrete surfacing, and any other foreign material and shall be crushed and processed to meet the required gradations for coarse aggregate. Crushed recycled concrete shall meet all other applicable requirements specified below.

d. Crushed Slag: Crushed slag shall be an air-cooled blast-furnace product having an air dry unit weight of not less than 65 pcf as determined by ASTM C 29/C 29M, and shall meet all the requirements specified below.

#### 2.1.1.1 Aggregate Base Course

ABC coarse aggregate shall not show more than 50 percent loss when subjected to the Los Angeles abrasion test in accordance with ASTM C 131. The amount of flat and elongated particles shall not exceed 30 percent. A flat particle is one having a ratio of width to thickness greater than 3; an elongated particle is one having a ratio of length to width greater than 3. In the portion retained on each sieve specified, the crushed aggregates shall contain at least 50 percent by weight of crushed pieces having two or more freshly fractured faces with the area of each face being at least equal to 75 percent of the smallest midsectional area of the piece. When two fractures are contiguous, the angle between planes of the fractures must be at least 30 degrees in order to count as two fractured faces. Crushed gravel shall be manufactured from gravel particles 50 percent of which, by weight, are retained on the maximum size sieve listed in TABLE 1.

#### 2.1.2 Fine Aggregate

Fine aggregates shall be angular particles of uniform density. When the fine aggregate is supplied from more than one source, aggregate from each source shall meet the specified requirements.

##### 2.1.2.1 Aggregate Base Course

ABC fine aggregate shall consist of screenings, angular sand, crushed recycled concrete fines, or other finely divided mineral matter processed or naturally combined with the coarse aggregate.

#### 2.1.3 Gradation Requirements

The specified gradation requirements shall apply to the completed base course. The aggregates shall have a maximum size of 8 mm 1.5 inches and shall be continuously well graded within the limits specified in TABLE 1. Sieves shall conform to ASTM E 11.

TABLE I. GRADATION OF AGGREGATES

Percentage by Weight Passing Square-Mesh Sieve

Sieve Designation	No. 1	No. 2	No. 3
-----	-----	-----	-----
2 inch	100	----	----
1-1/2 inch	70-100	100	----
1 inch	45-80	60-100	100
1/2 inch	30-60	30-65	40-70
No. 4	20-50	20-50	20-50
No. 10	15-40	15-40	15-40
No. 40	5-25	5-25	5-25
No. 200	0-10	0-10	0-10

NOTE 1: Particles having diameters less than 0.0008 inch shall not be in excess of 3 percent by weight of the total sample tested.

NOTE 2: The values are based on aggregates of uniform specific gravity. If materials from different sources are used for the coarse and fine aggregates, they shall be tested in accordance with ASTM C 127 and ASTM C 128 to determine their specific gravities. If the specific gravities vary by more than 10 percent, the percentages passing the various sieves shall be corrected as directed by the Contracting Officer.

#### 2.1.4 Liquid Limit and Plasticity Index

Liquid limit and plasticity index requirements shall apply to the completed course and shall also apply to any component that is blended to meet the required gradation. The portion of any component or of the completed course passing the No. 40 sieve shall be either nonplastic or have a liquid limit not greater than 25 and a plasticity index not greater than 5.

### PART 3 EXECUTION

#### 3.1 GENERAL REQUIREMENTS

When the ABC is constructed in more than one layer, the previously constructed layer shall be cleaned of loose and foreign matter by sweeping with power sweepers or power brooms, except that hand brooms may be used in areas where power cleaning is not practicable. Adequate drainage shall be provided during the entire period of construction to prevent water from collecting or standing on the working area. Line and grade stakes shall be provided as necessary for control. Grade stakes shall be in lines parallel to the centerline of the area under construction and suitably spaced for string lining.

#### 3.2 OPERATION OF AGGREGATE SOURCES

Aggregates shall be obtained from offsite sources.

#### 3.3 STOCKPILING MATERIAL

Prior to stockpiling of material, storage sites shall be cleared and



leveled by the Contractor. All materials, including approved material available from excavation and grading, shall be stockpiled in the manner and at the locations designated. Aggregates shall be stockpiled on the cleared and leveled areas designated by the Contracting Officer to prevent segregation. Materials obtained from different sources shall be stockpiled separately.

### 3.4 PREPARATION OF UNDERLYING COURSE

Prior to constructing the ABC, the underlying course or subgrade shall be cleaned of all foreign substances. At the time of construction of the ABC, the underlying course shall contain no frozen material. The surface of the underlying course or subgrade shall meet specified compaction and surface tolerances. The underlying course shall conform to Section 02300 EARTHWORK. Ruts or soft yielding spots in the underlying courses, areas having inadequate compaction, and deviations of the surface from the requirements set forth herein shall be corrected by loosening and removing soft or unsatisfactory material and by adding approved material, reshaping to line and grade, and recompacting to specified density requirements. For cohesionless underlying courses containing sands or gravels, as defined in ASTM D 2487, the surface shall be stabilized prior to placement of the ABC.

Stabilization shall be accomplished by mixing ABC into the underlying course and compacting by approved methods. The stabilized material shall be considered as part of the underlying course and shall meet all requirements of the underlying course. The finished underlying course shall not be disturbed by traffic or other operations and shall be maintained by the Contractor in a satisfactory condition until the ABC is placed.

### 3.5 INSTALLATION

#### 3.5.1 Mixing the Materials

The coarse and fine aggregates shall be mixed in a stationary plant, or in a traveling plant or bucket loader on an approved paved working area. The Contractor shall make adjustments in mixing procedures or in equipment as directed to obtain true grades, to minimize segregation or degradation, to obtain the required water content, and to insure a satisfactory ABC meeting all requirements of this specification.

#### 3.5.2 Placing

The mixed material shall be placed on the prepared subgrade or subbase in layers of uniform thickness with an approved spreader. When a compacted layer 6 inches or less in thickness is required, the material shall be placed in a single layer. When a compacted layer in excess of 6 inches is required, the material shall be placed in layers of equal thickness. No layer shall exceed 6 inches or less than 3 inches when compacted. The layers shall be so placed that when compacted they will be true to the grades or levels required with the least possible surface disturbance. Where the ABC is placed in more than one layer, the previously constructed layers shall be cleaned of loose and foreign matter by sweeping with power sweepers, power brooms, or hand brooms, as directed. Such adjustments in placing procedures or equipment shall be made as may be directed to obtain true grades, to minimize segregation and degradation, to adjust the water content, and to insure an acceptable ABC.

#### 3.5.3 Grade Control

The finished and completed ABC shall conform to the lines, grades, and cross sections shown. Underlying material(s) shall be excavated and prepared at sufficient depth for the required ABC thickness so that the finished ABC with the subsequent surface course will meet the designated grades.

#### 3.5.4 Edges of Base Course

The ABC shall be placed so that the completed section will be a minimum of 59 inches wider, on all sides, than the next layer that will be placed above it. Additionally, approved fill material shall be placed along the outer edges of ABC in sufficient quantities to compact to the thickness of the course being constructed, or to the thickness of each layer in a multiple layer course, allowing in each operation at least a 24 inch width of this material to be rolled and compacted simultaneously with rolling and compacting of each layer of ABC. If this base course material is to be placed adjacent to another pavement section, then the layers for both of these sections shall be placed and compacted along this edge at the same time.

#### 3.5.5 Compaction

Each layer of the ABC shall be compacted as specified with approved compaction equipment. Water content shall be maintained during the compaction procedure to within plus or minus 100 percent of the optimum water content determined from laboratory tests as specified in paragraph SAMPLING AND TESTING. Rolling shall begin at the outside edge of the surface and proceed to the center, overlapping on successive trips at least one-half the width of the roller. Alternate trips of the roller shall be slightly different lengths. Speed of the roller shall be such that displacement of the aggregate does not occur. In all places not accessible to the rollers, the mixture shall be compacted with hand-operated power tampers. Compaction shall continue until each layer has a degree of compaction that is at least 100 percent of laboratory maximum density through the full depth of the layer. The Contractor shall make such adjustments in compacting or finishing procedures as may be directed to obtain true grades, to minimize segregation and degradation, to reduce or increase water content, and to ensure a satisfactory ABC. Any materials that are found to be unsatisfactory shall be removed and replaced with satisfactory material or reworked, as directed, to meet the requirements of this specification.

#### 3.5.6 Thickness

Compacted thickness of the aggregate course shall be as indicated. No individual layer shall exceed 8 inches nor be less than 3 inches in compacted thickness. The total compacted thickness of the ABC course shall be within .5 inch of the thickness indicated. Where the measured thickness is more than .5 inch deficient, such areas shall be corrected by scarifying, adding new material of proper gradation, reblading, and recompacting as directed. Where the measured thickness is more than .5 inch thicker than indicated, the course shall be considered as conforming to the specified thickness requirements. Average job thickness shall be the average of all thickness measurements taken for the job, but shall be within .25 inch of the thickness indicated. The total thickness of the ABC course shall be measured at intervals in such a manner as to ensure one measurement for each 500 square yards of base course. Measurements shall be made in 3 inch diameter test holes penetrating the base course.

### 3.5.7 Proof Rolling

Proof rolling of the areas indicated shall be in addition to the compaction specified and shall consist of the application of 30 coverages with a heavy pneumatic-tired roller having four or more tires, each loaded to a minimum of 30,000 pounds and inflated to a minimum of 150 psi. In areas designated, proof rolling shall be applied to the top of the underlying material on which ABC is laid and to each layer of ABC. Water content of the underlying material shall be maintained at optimum or at the percentage directed from start of compaction to completion of proof rolling of that layer. Water content of each layer of the ABC shall be maintained at the optimum percentage directed from start of compaction to completion of proof rolling. Any ABC materials or any underlying materials that produce unsatisfactory results by proof rolling shall be removed and replaced with satisfactory materials, recompacted and proof rolled to meet these specifications.

### 3.5.8 Finishing

The surface of the top layer of ABC shall be finished after final compaction and proof rolling by cutting any overbuild to grade and rolling with a steel-wheeled roller. Thin layers of material shall not be added to the top layer of base course to meet grade. If the elevation of the top layer of ABC is .5 inch or more below grade, then the top layer should be scarified to a depth of at least .5 inch and new material shall be blended in, compacted and proof rolled to bring to grade. Adjustments to rolling and finishing procedures shall be made as directed to minimize segregation and degradation, obtain grades, maintain moisture content, and insure an acceptable base course. Should the surface become rough, corrugated, uneven in texture, or traffic marked prior to completion, the unsatisfactory portion shall be scarified, reworked and recompacted or it shall be replaced as directed.

### 3.5.9 Smoothness

The surface of the top layer shall show no deviations in excess of .25 inch when tested with a 10 feet straightedge. Measurements shall be taken in successive positions parallel to the centerline of the area to be paved. Measurements shall also be taken perpendicular to the centerline at 49 feet intervals. Deviations exceeding this amount shall be corrected by removing material and replacing with new material, or by reworking existing material and compacting it to meet these specifications.

### 3.6 TRAFFIC

Traffic shall not be allowed on the completed ABC course.

### 3.7 MAINTENANCE

The ABC shall be maintained in a satisfactory condition until the full pavement section is completed and accepted. Maintenance shall include immediate repairs to any defects and shall be repeated as often as necessary to keep the area intact. Any ABC that is not paved over prior to the onset of winter, shall be retested to verify that it still complies with the requirements of this specification. Any area of ABC that is damaged shall be reworked or replaced as necessary to comply with this specification.

### 3.8 DISPOSAL OF UNSATISFACTORY MATERIALS

Any unsuitable materials that must be removed shall be disposed of as directed. No additional payments will be made for materials that must be replaced.

-- End of Section --

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SECTION 02741

HOT-MIX ASPHALT (HMA) FOR ROADS  
**09/99**

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS  
(AASHTO)

AASHTO MP 2	(1998; Interim 1999) Superpave Volumetric Mix Design
AASHTO TP53	(1998; Interim 1999) Determining Asphalt Content of Hot Mix Asphalt by the Ignition Method

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 29/C 29M	(1997) Bulk Density ("Unit Weight") and Voids in Aggregates
ASTM C 88	(1999a) Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C 117	(1995) Materials Finer than 75 micrometer (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C 131	(1996) Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C 136	(1996a) Sieve Analysis of Fine and Coarse Aggregates
ASTM C 566	(1997) Evaporable Total Moisture Content of Aggregate by Drying
ASTM C 1252	(1998) Uncompacted Void Content of Fine Aggregate (as Influenced by Particle Shape, Surface Texture, and Grading)
ASTM D 140	(1998) Sampling Bituminous Materials
ASTM D 242	(1995) Mineral Filler for Bituminous Paving Mixtures
ASTM D 946	(1999) Penetration-Graded Asphalt Cement for Use in Pavement Construction
ASTM D 995	(1995b) Mixing Plants for Hot-Mixed,

Hot-Laid Bituminous Paving Mixtures

ASTM D 1461	(1985)) Moisture or Volatile Distillates in Bituminous Paving Mixtures
ASTM D 1559	(1989) Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus
ASTM D 2041	(1995) Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
ASTM D 2172	(1995) Quantitative Extraction of Bitumen from Bituminous Paving Mixtures
ASTM D 2419	(1995) Sand Equivalent Value of Soils and Fine Aggregate
ASTM D 2489	(1984; R 1994el) Degree of Particle Coating of Bituminous-Aggregate Mixtures
ASTM D 2726	(1996el) Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixture
ASTM D 2950	(1997) Density of Bituminous Concrete in Place by Nuclear Method
ASTM D 3381	(1999) Viscosity-Graded Asphalt Cement for Use in Pavement Construction
ASTM D 3665	(1999) Random Sampling of Construction Materials
ASTM D 3666	(1998) Minimum Requirements for Agencies Testing and Inspecting Bituminous Paving Materials
ASTM D 4125	(1994el)Asphalt Content of Bituminous Mixtures by the Nuclear Method
ASTM D 4791	(1999) Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate
ASTM D 4867/D 4867M	(1996) Effect of Moisture on Asphalt Concrete Paving Mixtures
ASTM D 5444	(1998) Mechanical Size Analysis of Extracted Aggregate
ASTM D 6307	(1998) Asphalt Content of Hot Mix Asphalt by Ignition Method

ASPHALT INSTITUTE (AI)

AI MS-2	(1997) Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types
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AI MS-22 (1998; 2nd Edition) Construction of  
Hot-Mix Asphalt Pavements

CALIFORNIA DEPARTMENT OF TRANSPORTATION (CDT)

CDT Test 526 (1978) Operation of California  
Profilograph and Evaluation of Profiles

CORPS OF ENGINEERS (COE)

COE CRD-C 171 (1995) Test Method for Determining  
Percentage of Crushed Particles in  
Aggregate

1.2 DESCRIPTION OF WORK

The work shall consist of pavement courses composed of mineral aggregate and asphalt material heated and mixed in a central mixing plant and placed on a prepared course. HMA designed and constructed in accordance with this section shall conform to the lines, grades, thicknesses, and typical cross sections shown on the drawings. Each course shall be constructed to the depth, section, or elevation required by the drawings and shall be rolled, finished, and approved before the placement of the next course.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Mix Design; G.

Proposed JMF.

Contractor Quality Control; G.

Quality control plan.

Material Acceptance and Percent Payment; G.

Acceptance test results and pay calculations.

SD-04 Samples

Asphalt Cement Binder.

5 gallon sample for mix design verification.

Aggregates.

Sufficient materials to produce 200 lb. of blended mixture for mix design verification.

SD-06 Test Reports

Aggregates; G.  
QC Monitoring.

Aggregate and QC test results.

SD-07 Certificates

Asphalt Cement Binder; G.

Copies of certified test data.

Testing Laboratory.

Certification of compliance.

Plant Scale Calibration Certification

#### 1.4 ASPHALT MIXING PLANT

Plants used for the preparation of hot-mix asphalt shall conform to the requirements of ASTM D 995 with the following changes:

a. Truck Scales. The asphalt mixture shall be weighed on approved certified scales at the Contractor's expense. Scales shall be inspected and sealed at least annually by an approved calibration laboratory.

b. Testing Facilities. The Contractor shall provide laboratory facilities at the plant for the use of the Government's acceptance testing and the Contractor's quality control testing.

c. Inspection of Plant. The Contracting Officer shall have access at all times, to all areas of the plant for checking adequacy of equipment; inspecting operation of the plant; verifying weights, proportions, and material properties; checking the temperatures maintained in the preparation of the mixtures and for taking samples. The Contractor shall provide assistance as requested, for the Government to procure any desired samples.

d. Storage Bins. Use of storage bins for temporary storage of hot-mix asphalt will be permitted as follows:

(1) The asphalt mixture may be stored in non-insulated storage bins for a period of time not exceeding 3 hours.

(2) The asphalt mixture may be stored in insulated storage bins for a period of time not exceeding 8 hours. The mix drawn from bins shall meet the same requirements as mix loaded directly into trucks.

#### 1.5 HAULING EQUIPMENT

Trucks used for hauling hot-mix asphalt shall have tight, clean, and smooth metal beds. To prevent the mixture from adhering to them, the truck beds shall be lightly coated with a minimum amount of paraffin oil, lime solution, or other approved material. Petroleum based products shall not be used as a release agent. Each truck shall have a suitable cover to protect the mixture from adverse weather. When necessary to ensure that the mixture will be delivered to the site at the specified temperature, truck beds shall be insulated or heated and covers (tarps) shall be securely fastened.

## 1.6 ASPHALT PAVERS

Asphalt pavers shall be self-propelled, with an activated screed, heated as necessary, and shall be capable of spreading and finishing courses of hot-mix asphalt which will meet the specified thickness, smoothness, and grade. The paver shall have sufficient power to propel itself and the hauling equipment without adversely affecting the finished surface.

### 1.6.1 Receiving Hopper

The paver shall have a receiving hopper of sufficient capacity to permit a uniform spreading operation. The hopper shall be equipped with a distribution system to place the mixture uniformly in front of the screed without segregation. The screed shall effectively produce a finished surface of the required evenness and texture without tearing, shoving, or gouging the mixture.

### 1.6.2 Automatic Grade Controls

If an automatic grade control device is used, the paver shall be equipped with a control system capable of automatically maintaining the specified screed elevation. The control system shall be automatically actuated from either a reference line and/or through a system of mechanical sensors or sensor-directed mechanisms or devices which will maintain the paver screed at a predetermined transverse slope and at the proper elevation to obtain the required surface. The transverse slope controller shall be capable of maintaining the screed at the desired slope within plus or minus 0.1 percent. A transverse slope controller shall not be used to control grade.

The controls shall be capable of working in conjunction with any of the following attachments:

- a. Ski-type device of not less than 29.5 feet in length.
- b. Taut stringline set to grade.
- c. Short ski or shoe for joint matching.
- d. Laser control.

## 1.7 ROLLERS

Rollers shall be in good condition and shall be operated at slow speeds to avoid displacement of the asphalt mixture. The number, type, and weight of rollers shall be sufficient to compact the mixture to the required density while it is still in a workable condition. Equipment which causes excessive crushing of the aggregate shall not be used.

## 1.8 WEATHER LIMITATIONS

The hot-mix asphalt shall not be placed upon a wet surface or when the surface temperature of the underlying course is less than specified in Table 1. The temperature requirements may be waived by the Contracting Officer, if requested; however, all other requirements, including compaction, shall be met.

Table 1. Surface Temperature Limitations of Underlying Course

<u>Mat Thickness, In.</u>	<u>Degrees C</u>
3 In. or greater	5
Less than 3 In.	8

## PART 2 PRODUCTS

### 2.1 AGGREGATES

Aggregates shall consist of crushed stone, crushed gravel, crushed slag, screenings, natural sand and mineral filler, as required. The portion of material retained on the No. 4 sieve is coarse aggregate. The portion of material passing the No. 4 sieve and retained on the No. 200 sieve is fine aggregate. The portion passing the No. 200 sieve is defined as mineral filler. All aggregate test results and samples shall be submitted to the Contracting Officer at least 14 days prior to start of construction.

#### 2.1.1 Coarse Aggregate

Coarse aggregate shall consist of sound, tough, durable particles, free from films of material that would prevent thorough coating and bonding with the asphalt material and free from organic matter and other deleterious substances. All individual coarse aggregate sources shall meet the following requirements:

a. The percentage of loss shall not be greater than 40 percent after 500 revolutions when tested in accordance with ASTM C 131.

b. The percentage of loss shall not be greater than 18 percent after five cycles when tested in accordance with ASTM C 88 using magnesium sulfate or 12 percent when using sodium sulfate.

c. At least 75 percent by weight of coarse aggregate shall have at least two or more fractured faces when tested in accordance with COE CRD-C 171. Fractured faces shall be produced by crushing.

d. The particle shape shall be essentially cubical and the aggregate shall not contain more than 20% percent, by weight, of flat and elongated particles (3:1 ratio of maximum to minimum) when tested in accordance with ASTM D 4791.

e. Slag shall be air-cooled, blast furnace slag, and shall have a compacted weight of not less than 75 lb/cu ft when tested in accordance with ASTM C 29/C 29M.

#### 2.1.2 Fine Aggregate

Fine aggregate shall consist of clean, sound, tough, durable particles. The aggregate particles shall be free from coatings of clay, silt, or any objectionable material and shall contain no clay balls. All individual fine aggregate sources shall have a sand equivalent value not less than 45 when tested in accordance with ASTM D 2419.

The fine aggregate portion of the blended aggregate shall have an uncompacted void content not less than 43.0 percent when tested in

accordance with ASTM C 1252 Method A.

### 2.1.3 Mineral Filler

Mineral filler shall be nonplastic material meeting the requirements of ASTM D 242.

### 2.1.4 Aggregate Gradation

The combined aggregate gradation shall conform to gradations specified in Table 2, when tested in accordance with ASTM C 136 and ASTM C 117, and shall not vary from the low limit on one sieve to the high limit on the adjacent sieve or vice versa, but grade uniformly from coarse to fine.

Table 2. Aggregate Gradations

<u>Sieve Size, inch</u>	<u>Gradation 1</u> <u>Percent Passing</u> <u>by Mass</u>	<u>Gradation 2</u> <u>Percent Passing</u> <u>by Mass</u>	<u>Gradation 3</u> <u>Percent Passing</u> <u>by Mass</u>
1	100	---	---
3/4	76-96	100	---
1/2	68-88	76-96	100
3/8	60-82	69-89	76-96
No. 4	45-67	53-73	58-78
No. 8	32-54	38-60	40-60
No. 16	22-44	26-48	28-48
No. 30	15-35	18-38	18-38
No. 50	9-25	11-27	11-27
No. 100	6-18	6-18	6-18
No. 200	3-6	3-6	3-6

### 2.2 ASPHALT CEMENT BINDER

Asphalt cement binder shall conform to ASTM D 3381 Table 2, Viscosity Grade ASTM D 946 penetration grade. Test data indicating grade certification shall be provided by the supplier at the time of delivery of each load to the mix plant. Copies of these certifications shall be submitted to the Contracting Officer. The supplier is defined as the last source of any modification to the binder. The Contracting Officer may sample and test the binder at the mix plant at any time before or during mix production. Samples for this verification testing shall be obtained by the Contractor in accordance with ASTM D 140 and in the presence of the Contracting Officer. These samples shall be furnished to the Contracting Officer for the verification testing, which shall be at no cost to the Contractor. Samples of the asphalt cement specified shall be submitted for approval not less than 14 days before start of the test section.

### 2.3 MIX DESIGN

The Contractor shall develop the mix design. The asphalt mix shall be composed of a mixture of well-graded aggregate, mineral filler if required, and asphalt material. The aggregate fractions shall be sized, handled in separate size groups, and combined in such proportions that the resulting mixture meets the grading requirements of the job mix formula (JMF). No hot-mix asphalt for payment shall be produced until a JMF has been approved. The hot-mix asphalt shall be designed using procedures contained in AI MS-2 and the criteria shown in Table 3. If the Tensile Strength

Ratio (TSR) of the composite mixture, as determined by ASTM D 4867/D 4867M is less than 75, the aggregates shall be rejected or the asphalt mixture treated with an approved anti-stripping agent. The amount of anti-stripping agent added shall be sufficient to produce a TSR of not less than 75. If an antistrip agent is required, it shall be provided by the Contractor at no additional cost. Sufficient materials to produce 200 pound of blended mixture shall be provided to the Contracting Officer for verification of mix design at least 14 days prior to construction of test section.

At the option of the contractor a currently used DOT superpave hot mix may be used in lieu of developing a new hot mix design study as described herein. The superpave volumetric mix shall be designed in accordance with AASHTO MP 2.

#### 2.3.1 JMF Requirements

The job mix formula shall be submitted in writing by the Contractor for approval at least 14 days prior to the start of the test section and shall include as a minimum:

- a. Percent passing each sieve size.
- b. Percent of asphalt cement.
- c. Percent of each aggregate and mineral filler to be used.
- d. Asphalt viscosity grade, penetration grade, or performance grade.
- e. Number of blows of hammer per side of molded specimen.
- f. Laboratory mixing temperature.
- g. Lab compaction temperature.
- h. Temperature-viscosity relationship of the asphalt cement.
- i. Plot of the combined gradation on the 0.45 power gradation chart, stating the nominal maximum size.
- j. Graphical plots of stability, flow, air voids, voids in the mineral aggregate, and unit weight versus asphalt content as shown in AI MS-2.
- k. Specific gravity and absorption of each aggregate.
- l. Percent natural sand.
- m. Percent particles with 2 or more fractured faces (in coarse aggregate).
- n. Fine aggregate angularity.
- o. Percent flat or elongated particles (in coarse aggregate).
- p. Tensile Strength Ratio(TSR).
- q. Antistrip agent (if required) and amount.

r. List of all modifiers and amount.

s. Percentage and properties (asphalt content, binder properties, and aggregate properties) of reclaimed asphalt pavement (RAP) in accordance with paragraph RECYCLED HOT-MIX ASPHALT, if RAP is used.

Table 3. Marshall Design Criteria

<u>Test Property</u>	<u>75 Blow Mix</u>	<u>50 Blow Mix</u>
Stability, pounds minimum	*1800	*1000
Flow, 0.01 inch	8-16	8-18
Air voids, percent	3-5	3-5
Percent Voids in mineral aggregate VMA, (minimum)		
Gradation 1	13.0	13.0
Gradation 2	14.0	14.0
Gradation 3	15.0	15.0
TSR, minimum percent	75	75

\* This is a minimum requirement. The average during construction shall be significantly higher than this number to ensure compliance with the specifications.

\*\* Calculate VMA in accordance with AI MS-2, based on ASTM D 2726 bulk specific gravity for the aggregate.

#### 2.3.2 Adjustments to Field JMF

The Laboratory JMF for each mixture shall be in effect until a new formula is approved in writing by the Contracting Officer. Should a change in sources of any materials be made, a new laboratory jmf design shall be performed and a new JMF approved before the new material is used. The Contractor will be allowed to adjust the Laboratory JMF within the limits specified below to optimize mix volumetric properties with the approval of the Contracting Officer. Adjustments to the Laboratory JMF shall be applied to the field (plant) established JMF and limited to those values as shown. Adjustments shall be targeted to produce or nearly produce 4 percent voids total mix (VTM).

TABLE 4. Field (Plant) Established JMF Tolerances  
Sieves                      Adjustments (plus or minus), percent

No. 4	3
No. 8	3
No. 200	1
Binder Content	0.40

If adjustments are needed that exceed these limits, a new mix design shall be developed. Tolerances given above may permit the aggregate grading to be outside the limits shown in Table 2; while not desirable, this is acceptable.

## 2.4 RECYCLED HOT MIX ASPHALT

Recycled HMA shall consist of reclaimed asphalt pavement (RAP), coarse aggregate, fine aggregate, mineral filler, and asphalt cement. The RAP shall be of a consistent gradation and asphalt content and properties. When RAP is fed into the plant, the maximum RAP chunk size shall not exceed 2 inches. The recycled HMA mix shall be designed using procedures contained in AI MS-2 and AI MS-22. The job mix shall meet the requirements of paragraph MIX DESIGN. The amount of RAP shall not exceed 30 percent.

### 2.4.1 RAP Aggregates and Asphalt Cement

The blend of aggregates used in the recycled mix shall meet the requirements of paragraph AGGREGATES. The percentage of asphalt in the RAP shall be established for the mixture design according to ASTM D 2172 using the appropriate dust correction procedure.

### 2.4.2 RAP Mix

The blend of new asphalt cement and the RAP asphalt binder shall meet the penetration and viscosity requirements in paragraph ASPHALT CEMENT BINDER. The virgin asphalt cement shall not be more than two standard asphalt material grades different than that specified in paragraph ASPHALT CEMENT BINDER.

## PART 3 EXECUTION

### 3.1 PREPARATION OF ASPHALT BINDER MATERIAL

The asphalt cement material shall be heated avoiding local overheating and providing a continuous supply of the asphalt material to the mixer at a uniform temperature. The temperature of unmodified asphalts shall be no more than 170 degrees C when added to the aggregates. Modified asphalts shall be no more than 185 degrees C when added to the aggregates.

### 3.2 PREPARATION OF MINERAL AGGREGATE

The aggregate for the mixture shall be heated and dried prior to mixing. No damage shall occur to the aggregates due to the maximum temperature and rate of heating used. The temperature of the aggregate and mineral filler shall not exceed 170 degrees C when the asphalt cement is added. The temperature shall not be lower than is required to obtain complete coating and uniform distribution on the aggregate particles and to provide a mixture of satisfactory workability.

### 3.3 PREPARATION OF HOT-MIX ASPHALT MIXTURE

The aggregates and the asphalt cement shall be weighed or metered and introduced into the mixer in the amount specified by the JMF. The combined materials shall be mixed until the aggregate obtains a uniform coating of asphalt binder and is thoroughly distributed throughout the mixture. Wet mixing time shall be the shortest time that will produce a satisfactory mixture, but no less than 25 seconds for batch plants. The wet mixing time for all plants shall be established by the Contractor, based on the procedure for determining the percentage of coated particles described in ASTM D 2489, for each individual plant and for each type of aggregate used.

The wet mixing time will be set to at least achieve 95 percent of coated particles. The moisture content of all hot-mix asphalt upon discharge from the plant shall not exceed 0.5 percent by total weight of mixture as



measured by ASTM D 1461.

### 3.4 PREPARATION OF THE UNDERLYING SURFACE

Immediately before placing the hot mix asphalt, the underlying course shall be cleaned of dust and debris. A tack coat shall be applied in accordance with the contract specifications.

### 3.5 TEST SECTION

Prior to full production, the Contractor shall place a test section for each JMF used. The contractor shall construct a test section 250-500 feet long and two paver passes wide placed for two lanes, with a longitudinal cold joint. The test section shall be of the same depth as the course which it represents. The underlying grade or pavement structure upon which the test section is to be constructed shall be the same as the remainder of the course represented by the test section. The equipment and personnel used in construction of the test section shall be the same equipment to be used on the remainder of the course represented by the test section. The test section shall be placed as part of the project pavement as approved by the Contracting Officer.

#### 3.5.1 Sampling and Testing for Test Section

One random sample shall be taken at the plant, triplicate specimens compacted, and tested for stability, flow, and laboratory air voids. A portion of the same sample shall be tested for aggregate gradation and asphalt content. Four randomly selected cores shall be taken from the finished pavement mat, and four from the longitudinal joint, and tested for density. Random sampling shall be in accordance with procedures contained in ASTM D 3665. The test results shall be within the tolerances shown in Table 5 for work to continue. If all test results meet the specified requirements, the test section shall remain as part of the project pavement. If test results exceed the tolerances shown, the test section shall be removed and replaced at no cost to the Government and another test section shall be constructed. The test section shall be paid for with the first lot of paving

Table 5. Test Section Requirements for Material and Mixture Properties

<u>Property</u>	<u>Specification Limit</u>
Aggregate Gradation-Percent Passing (Individual Test Result)	
No. 4 and larger	JMF plus or minus 8
No. 8, No. 16, No. 30, and No. 50	JMF plus or minus 6
No. 100 and No. 200	JMF plus or minus 2.0
Asphalt Content, Percent (Individual Test Result)	JMF plus or minus 0.5
Laboratory Air Voids, Percent (Average of 3 specimens)	JMF plus or minus 1.0
VMA, Percent (Average of 3 specimens)	13 minimum

Table 5. Test Section Requirements for Material and Mixture Properties

<u>Property</u>	<u>Specification Limit</u>
Stability, kilograms (Average of 3 specimens)	500 minimum
Flow, 1 inch (Average of 3 specimens)	2-4
Mat Density, Percent of Marshall (Average of 4 Random Cores)	97.0 - 100.5
Joint Density, Percent of Marshall (Average of 4 Random Cores)	95.5 - 100.5

### 3.5.2 Additional Test Sections

If the initial test section should prove to be unacceptable, the necessary adjustments to the JMF, plant operation, placing procedures, and/or rolling procedures shall be made. A second test section shall then be placed. Additional test sections, as required, shall be constructed and evaluated for conformance to the specifications. Full production shall not begin until an acceptable section has been constructed and accepted.

### 3.6 TESTING LABORATORY

The laboratory used to develop the JMF shall meet the requirements of ASTM D 3666. A certification signed by the manager of the laboratory stating that it meets these requirements or clearly listing all deficiencies shall be submitted to the Contracting Officer prior to the start of construction. The certification shall contain as a minimum:

- a. Qualifications of personnel; laboratory manager, supervising technician, and testing technicians.
- b. A listing of equipment to be used in developing the job mix.
- c. A copy of the laboratory's quality control system.
- d. Evidence of participation in the AASHTO Materials Reference Laboratory (AMRL) program.

### 3.7 TRANSPORTING AND PLACING

#### 3.7.1 Transporting

The hot-mix asphalt shall be transported from the mixing plant to the site in clean, tight vehicles. Deliveries shall be scheduled so that placing and compacting of mixture is uniform with minimum stopping and starting of the paver. Adequate artificial lighting shall be provided for night placements. Hauling over freshly placed material will not be permitted until the material has been compacted as specified, and allowed to cool to 65 degrees C. To deliver mix to the paver, the Contractor shall use a material transfer vehicle which shall be operated to produce continuous forward motion of the paver.

#### 3.7.2 Placing

The mix shall be placed and compacted at a temperature suitable for obtaining density, surface smoothness, and other specified requirements.

Upon arrival, the mixture shall be placed to the full width by an asphalt paver; it shall be struck off in a uniform layer of such depth that, when the work is completed, it shall have the required thickness and conform to the grade and contour indicated. The speed of the paver shall be regulated to eliminate pulling and tearing of the asphalt mat. Unless otherwise permitted, placement of the mixture shall begin along the centerline of a crowned section or on the high side of areas with a one-way slope. The mixture shall be placed in consecutive adjacent strips having a minimum width of 10 feet. The longitudinal joint in one course shall offset the longitudinal joint in the course immediately below by at least 12 inches; however, the joint in the surface course shall be at the centerline of the pavement. Transverse joints in one course shall be offset by at least 10 feet from transverse joints in the previous course. Transverse joints in adjacent lanes shall be offset a minimum of 10 feet. On isolated areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impractical, the mixture may be spread and luted by hand tools.

### 3.8 COMPACTION OF MIXTURE

After placing, the mixture shall be thoroughly and uniformly compacted by rolling. The surface shall be compacted as soon as possible without causing displacement, cracking or shoving. The sequence of rolling operations and the type of rollers used shall be at the discretion of the Contractor. The speed of the roller shall, at all times, be sufficiently slow to avoid displacement of the hot mixture and be effective in compaction. Any displacement occurring as a result of reversing the direction of the roller, or from any other cause, shall be corrected at once. Sufficient rollers shall be furnished to handle the output of the plant. Rolling shall continue until the surface is of uniform texture, true to grade and cross section, and the required field density is obtained. To prevent adhesion of the mixture to the roller, the wheels shall be kept properly moistened but excessive water will not be permitted.

In areas not accessible to the roller, the mixture shall be thoroughly compacted with hand tampers. Any mixture that becomes loose and broken, mixed with dirt, contains check-cracking, or is in any way defective shall be removed full depth, replaced with fresh hot mixture and immediately compacted to conform to the surrounding area. This work shall be done at the Contractor's expense. Skin patching will not be allowed.

### 3.9 JOINTS

The formation of joints shall be made ensuring a continuous bond between the courses and to obtain the required density. All joints shall have the same texture as other sections of the course and meet the requirements for smoothness and grade.

#### 3.9.1 Transverse Joints

The roller shall not pass over the unprotected end of the freshly laid mixture, except when necessary to form a transverse joint. When necessary to form a transverse joint, it shall be made by means of placing a bulkhead or by tapering the course. The tapered edge shall be cut back to its full depth and width on a straight line to expose a vertical face prior to placing material at the joint. The cutback material shall be removed from the project. In both methods, all contact surfaces shall be given a light tack coat of asphalt material before placing any fresh mixture against the joint.

### 3.9.2 Longitudinal Joints

Longitudinal joints which are irregular, damaged, uncompacted, cold (less than 85 degrees C at the time of placing adjacent lanes), or otherwise defective, shall be cut back a minimum of 2 inches from the edge with a cutting wheel to expose a clean, sound vertical surface for the full depth of the course. All cutback material shall be removed from the project. All contact surfaces shall be given a light tack coat of asphalt material prior to placing any fresh mixture against the joint. The Contractor will be allowed to use an alternate method if it can be demonstrated that density, smoothness, and texture can be met.

### 3.10 CONTRACTOR QUALITY CONTROL

#### 3.10.1 General Quality Control Requirements

The Contractor shall develop an approved Quality Control Plan. Hot-mix asphalt for payment shall not be produced until the quality control plan has been approved. The plan shall address all elements which affect the quality of the pavement including, but not limited to:

- a. Mix Design
- b. Aggregate Grading
- c. Quality of Materials
- d. Stockpile Management
- e. Proportioning
- f. Mixing and Transportation
- g. Mixture Volumetrics
- h. Moisture Content of Mixtures
- i. Placing and Finishing
- j. Joints
- k. Compaction
- l. Surface Smoothness

#### 3.10.2 Testing Laboratory

The Contractor shall provide a fully equipped asphalt laboratory located at the plant or job site. The laboratory shall meet the requirements as required in ASTM D 3666. The effective working area of the laboratory shall be a minimum of 150 square feet with a ceiling height of not less than 7.5 feet. Lighting shall be adequate to illuminate all working areas. It shall be equipped with heating and air conditioning units to maintain a temperature of 75 degrees F plus or minus 5 degrees F. Laboratory facilities shall be kept clean and all equipment shall be maintained in proper working condition. The Contracting Officer shall be permitted unrestricted access to inspect the Contractor's laboratory facility, to witness quality control activities, and to perform any check testing desired. The Contracting Officer will advise the Contractor in

writing of any noted deficiencies concerning the laboratory facility, equipment, supplies, or testing personnel and procedures. When the deficiencies are serious enough to adversely affect test results, the incorporation of the materials into the work shall be suspended immediately and will not be permitted to resume until the deficiencies are corrected.

### 3.10.3 Quality Control Testing

The Contractor shall perform all quality control tests applicable to these specifications and as set forth in the Quality Control Program. The testing program shall include, but shall not be limited to, tests for the control of asphalt content, aggregate gradation, temperatures, aggregate moisture, moisture in the asphalt mixture, laboratory air voids, stability, flow, in-place density, grade and smoothness. A Quality Control Testing Plan shall be developed as part of the Quality Control Program.

#### 3.10.3.1 Asphalt Content

A minimum of two tests to determine asphalt content will be performed per lot (a lot is defined in paragraph MATERIAL ACCEPTANCE AND PERCENT PAYMENT) by one of the following methods: the extraction method in accordance with ASTM D 2172, Method A or B, the ignition method in accordance with the AASHTO TP53 or ASTM D 6307, or the nuclear method in accordance with ASTM D 4125, provided the nuclear gauge is calibrated for the specific mix being used. For the extraction method, the weight of ash, as described in ASTM D 2172, shall be determined as part of the first extraction test performed at the beginning of plant production; and as part of every tenth extraction test performed thereafter, for the duration of plant production. The last weight of ash value obtained shall be used in the calculation of the asphalt content for the mixture.

#### 3.10.3.2 Gradation

Aggregate gradations shall be determined a minimum of twice per lot from mechanical analysis of recovered aggregate in accordance with ASTM D 5444. When asphalt content is determined by the nuclear method, aggregate gradation shall be determined from hot bin samples on batch plants, or from the cold feed on drum mix plants. For batch plants, aggregates shall be tested in accordance with ASTM C 136 using actual batch weights to determine the combined aggregate gradation of the mixture.

#### 3.10.3.3 Temperatures

Temperatures shall be checked at least four times per lot, at necessary locations, to determine the temperature at the dryer, the asphalt cement in the storage tank, the asphalt mixture at the plant, and the asphalt mixture at the job site.

#### 3.10.3.4 Aggregate Moisture

The moisture content of aggregate used for production shall be determined a minimum of once per lot in accordance with ASTM C 566.

#### 3.10.3.5 Moisture Content of Mixture

The moisture content of the mixture shall be determined at least once per lot in accordance with ASTM D 1461 or an approved alternate procedure.

#### 3.10.3.6 Laboratory Air Voids, Marshall Stability and Flow

Mixture samples shall be taken at least four times per lot and compacted into specimens, using 50 blows per side with the Marshall hammer as described in ASTM D 1559. After compaction, the laboratory air voids of each specimen shall be determined, as well as the Marshall stability and flow.

#### 3.10.3.7 In-Place Density

The Contractor shall conduct any necessary testing to ensure the specified density is achieved. A nuclear gauge may be used to monitor pavement density in accordance with ASTM D 2950.

#### 3.10.3.8 Grade and Smoothness

The Contractor shall conduct the necessary checks to ensure the grade and smoothness requirements are met in accordance with paragraph MATERIAL ACCEPTANCE AND PERCENT PAYMENT.

#### 3.10.3.9 Additional Testing

Any additional testing, which the Contractor deems necessary to control the process, may be performed at the Contractor's option.

#### 3.10.3.10 QC Monitoring

The Contractor shall submit all QC test results to the Contracting Officer on a daily basis as the tests are performed. The Contracting Officer reserves the right to monitor any of the Contractor's quality control testing and to perform duplicate testing as a check to the Contractor's quality control testing.

#### 3.10.4 Sampling

When directed by the Contracting Officer, the Contractor shall sample and test any material which appears inconsistent with similar material being produced, unless such material is voluntarily removed and replaced or deficiencies corrected by the Contractor. All sampling shall be in accordance with standard procedures specified.

#### 3.10.5 Control Charts

For process control, the Contractor shall establish and maintain linear control charts on both individual samples and the running average of last four samples for the parameters listed in Table 6, as a minimum. These control charts shall be posted as directed by the Contracting Officer and shall be kept current at all times. The control charts shall identify the project number, the test parameter being plotted, the individual sample numbers, the Action and Suspension Limits listed in Table 6 applicable to the test parameter being plotted, and the Contractor's test results. Target values from the JMF shall also be shown on the control charts as indicators of central tendency for the cumulative percent passing, asphalt content, and laboratory air voids parameters. When the test results exceed either applicable Action Limit, the Contractor shall take immediate steps to bring the process back in control. When the test results exceed either applicable Suspension Limit, the Contractor shall halt production until the problem is solved. The Contractor shall use the control charts as part of the process control system for identifying trends so that potential problems can be corrected before they occur. Decisions concerning mix

modifications shall be made based on analysis of the results provided in the control charts. The Quality Control Plan shall indicate the appropriate action which shall be taken to bring the process into control when certain parameters exceed their Action Limits.

Table 6. Action and Suspension Limits for the Parameters to be Plotted on Individual and Running Average Control Charts

<u>Parameter to be Plotted</u>	<u>Running Average of Individual Samples</u>		<u>Last Four Samples</u>	
	<u>Action Limit</u>	<u>Suspension Limit</u>	<u>Action Limit</u>	<u>Suspension Limit</u>
No. 4 sieve, Cumulative % Passing, deviation from JMF target; plus or minus values	6	8	4	5
No. 30 sieve, Cumulative % Passing, deviation from JMF target; plus or minus values	4	6	3	4
No. 200 sieve, Cumulative % Passing, deviation from JMF target; plus or minus values	1.4	2.0	1.1	1.5
Stability, pounds (minimum)				
75 Blow JMF	1800	1700	1900	1800
50 Blow JMF	1000	900	1100	1000
Flow, 0.01 inches				
75 Blow	8 min. 16 max.	7 min. 17 max.	9 min. 15 max.	8 min. 16 max.
50 Blow	8 min. 18 max.	7 min. 19 max.	9 min. 17 max.	8 min. 18 max.
Asphalt content, % deviation from JMF target; plus or minus value	0.4	0.5	0.2	0.3
Laboratory Air Voids, % deviation from JMF target value	No specific action and suspension limits set since this parameter is used to determine percent payment			
In-place Mat Density, % of Marshall density	No specific action and suspension limits set since this parameter is used to determine percent payment			
In-place Joint Density, % of Marshall density	No specific action and suspension limits set since this parameter is used to determine percent payment			

### 3.11 MATERIAL ACCEPTANCE AND PERCENT PAYMENT

#### 3.11.1 Sublot Sampling

One random mixture sample for determining laboratory air voids, theoretical maximum density, and for any additional testing the Contracting Officer desires, will be taken from a loaded truck delivering mixture to each

sublot, or other appropriate location for each sublot. All samples will be selected randomly, using commonly recognized methods of assuring randomness conforming to ASTM D 3665 and employing tables of random numbers or computer programs. Laboratory air voids will be determined from three laboratory compacted specimens of each sublot sample in accordance with ASTM D 1559. The specimens will be compacted within 2 hours of the time the mixture was loaded into trucks at the asphalt plant. Samples will not be reheated prior to compaction and insulated containers will be used as necessary to maintain the temperature.

#### 3.11.2 Additional Sampling and Testing

The Contracting Officer reserves the right to direct additional samples and tests for any area which appears to deviate from the specification requirements. The cost of any additional testing will be paid for by the Government. Testing in these areas will be in addition to the lot testing, and the requirements for these areas will be the same as those for a lot.

#### 3.11.3 Laboratory Air Voids

Laboratory air voids will be calculated by determining the Marshall density of each lab compacted specimen using ASTM D 2726 and determining the theoretical maximum density of every other sublot sample using ASTM D 2041.

Laboratory air void calculations for each sublot will use the latest theoretical maximum density values obtained, either for that sublot or the previous sublot. The mean absolute deviation of the four laboratory air void contents (one from each sublot) from the JMF air void content will be evaluated and a pay factor determined from Table 7. All laboratory air void tests will be completed and reported within 24 hours after completion of construction of each lot.

#### 3.11.4 Mean Absolute Deviation

An example of the computation of mean absolute deviation for laboratory air voids is as follows: Assume that the laboratory air voids are determined from 4 random samples of a lot (where 3 specimens were compacted from each sample). The average laboratory air voids for each sublot sample are determined to be 3.5, 3.0, 4.0, and 3.7. Assume that the target air voids from the JMF is 4.0.

#### 3.11.5 In-place Density

##### 3.11.5.1 General Density Requirements

For determining in-place density, one random core will be taken by the Government from the mat (interior of the lane) of each sublot, and one random core will be taken from the joint (immediately over joint) of each sublot. Each random core will be full thickness of the layer being placed.

When the random core is less than 1 inch thick, it will not be included in the analysis. In this case, another random core will be taken. After air drying to a constant weight, cores obtained from the mat and from the joints will be used for in-place density determination.

##### 3.11.5.2 Mat and Joint Densities

The average in-place mat and joint densities are expressed as a percentage of the average Marshall density for the lot. The Marshall density for each lot will be determined as the average Marshall density of the four random samples (3 specimens compacted per sample). The average in-place mat



density and joint density for a lot are determined and compared with Table 8 to calculate a single pay factor per lot based on in-place density, as described below. First, a pay factor for both mat density and joint density are determined from Table 8. The area associated with the joint is then determined and will be considered to be 10 feet wide times the length of completed longitudinal construction joint in the lot. This area will not exceed the total lot size. The length of joint to be considered will be that length where a new lane has been placed against an adjacent lane of hot-mix asphalt pavement, either an adjacent freshly paved lane or one paved at any time previously. The area associated with the joint is expressed as a percentage of the total lot area. A weighted pay factor for the joint is determined based on this percentage (see example below). The pay factor for mat density and the weighted pay factor for joint density is compared and the lowest selected. This selected pay factor is the pay factor based on density for the lot. When the Marshall density on both sides of a longitudinal joint is different, the average of these two densities will be used as the Marshall density needed to calculate the percent joint density. All density results for a lot will be completed and reported within 24 hours after the construction of that lot.

#### 3.11.6 Grade

The final wearing surface of pavement shall conform to the elevations and cross sections shown and shall vary not more than .06 inch from the plan grade established and approved at site of work. Finished surfaces at juncture with other pavements shall coincide with finished surfaces of abutting pavements. Deviation from the plan elevation will not be permitted in areas of pavements where closer conformance with planned elevation is required for the proper functioning of drainage and other appurtenant structures involved. The final wearing surface of the pavement will be tested for conformance with specified plan grade requirements. The grade will be determined by running lines of levels at intervals of 25 feet, or less, longitudinally and transversely, to determine the elevation of the completed pavement surface. Within 5 working days, after the completion of a particular lot incorporating the final wearing surface, the Contracting Officer will inform the Contractor in writing, of the results of the grade-conformance tests. When more than 5 percent of all measurements made within a lot are outside the .06 inch tolerance, the pay factor based on grade for that lot will be 95 percent. In areas where the grade exceeds the tolerance by more than 50 percent, the Contractor shall remove the surface lift full depth; the Contractor shall then replace the lift with hot-mix asphalt to meet specification requirements, at no additional cost to the Government. Diamond grinding may be used to remove high spots to meet grade requirements. Skin patching for correcting low areas or planing or milling for correcting high areas will not be permitted.

#### 3.11.7 Surface Smoothness

The Contractor shall use one of the following methods to test and evaluate surface smoothness of the pavement. All testing shall be performed in the presence of the Contracting Officer. Detailed notes of the results of the testing shall be kept and a copy furnished to the Government immediately after each day's testing. The profilograph method shall be used for all longitudinal and transverse testing, except where the runs would be less than 60 meters in length and the ends where the straightedge shall be used. Where drawings show required deviations from a plane surface (crowns, drainage inlets, etc.), the surface shall be finished to meet the approval of the Contracting Officer.

### 3.11.7.1 Smoothness Requirements

a. Straightedge Testing: The finished surfaces of the pavements shall have no abrupt change of .25 inch or more, and all pavements shall be within the tolerances specified in Table 9 when checked with an approved straightedge.

Table 9. Straightedge Surface Smoothness--Pavements		
Pavement Category	Direction of Testing	Tolerance, inches
-----	-----	-----
All	Longitudinal	6
paved areas	Transverse	6

b. Profilograph Testing: The finished surfaces of the pavements shall have no abrupt change of .25 inch or more, and all pavement shall have a Profile Index not greater than specified in Table 10 when tested with an approved California-type profilograph. If the extent of the pavement in either direction is less than 180 feet, that direction shall be tested by the straightedge method and shall meet requirements specified above.

Table 10. Profilograph Surface Smoothness--Pavements		
Pavement Category	Direction of Testing	Maximum Specified Profile Index (mm/km)
-----	-----	-----
All Paved Areas	Longitudinal	140

### 3.11.7.2 Testing Method

After the final rolling, but not later than 24 hours after placement, the surface of the pavement in each entire lot shall be tested by the Contractor in such a manner as to reveal all surface irregularities exceeding the tolerances specified above. Separate testing of individual sublots is not required. If any pavement areas are ground, these areas shall be retested immediately after grinding. The entire area of the pavement shall be tested in both a longitudinal and a transverse direction on parallel lines. The transverse lines shall be 24.5 feet or less apart, as directed. The longitudinal lines shall be at the centerline of each paving lane for lines less than 20 feet and at the third points for lanes 20 feet or greater. Other areas having obvious deviations shall also be tested. Longitudinal testing lines shall be continuous across all joints.

a. Straightedge Testing. The straightedge shall be held in contact with the surface and moved ahead one-half the length of the straightedge for each successive measurement. The amount of surface irregularity shall be determined by placing the freestanding (unleveled) straightedge on the pavement surface and allowing it to rest upon the two highest spots covered by its length, and measuring the maximum gap between the straightedge and the pavement surface in the area between these two high points.

b. Profilograph Testing. Profilograph testing shall be performed using approved equipment and procedures described in CDT Test 526. The equipment shall utilize electronic recording and automatic computerized reduction of data to indicate "must-grind" bumps and the Profile Index for the pavement. The "blanking band" shall be .2 inch wide and the "bump template" shall span 1 inch with an offset of .4 inch. The profilograph

shall be operated by an approved, factory-trained operator on the alignments specified above. A copy of the reduced tapes shall be furnished the Government at the end of each day's testing.

-- End of Section --

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SECTION 02763

PAVEMENT MARKINGS

09/98

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 792	(1991) Density and Specific Gravity (Relative Density) of Plastics by Displacement
ASTM D 4505	(1996) Preformed Plastic Pavement Marking Tape for Extended Service Life
ASTM E 28	(1997) Softening Point of Resins by Ring and Ball Apparatus

FEDERAL SPECIFICATIONS (FS)

FS TT-P-1952	(Rev D) Paint, Traffic and Airfield Marking, Waterborne (Metric)
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1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Equipment; G.

Lists of proposed equipment, including descriptive data, and notifications of proposed Contractor actions as specified in this section. List of removal equipment shall include descriptive data indicating area of coverage per pass, pressure adjustment range, tank and flow capacities, and safety precautions required for the equipment operation.

Composition Requirements.

Manufacturer's current printed product description and Material Safety Data Sheets (MSDS) for each type paint/color proposed for use.

Qualifications.

Document certifying that personnel are qualified for equipment

operation and handling of chemicals.

#### SD-06 Test Reports

Sampling and Testing.

Certified copies of the test reports, prior to the use of the materials at the jobsite. Testing shall be performed in an approved independent laboratory.

#### SD-07 Certificates

Volatile Organic Compound (VOC).

Certificate stating that the proposed pavement marking paint meets the VOC regulations of the local Air Pollution Control District having jurisdiction over the geographical area in which the project is located.

### 1.3 DELIVERY AND STORAGE

All materials shall be delivered and stored in sealed containers that plainly show the designated name, formula or specification number, batch number, color, date of manufacture, manufacturer's name, and directions, all of which shall be plainly legible at time of use.

### 1.4 EQUIPMENT

All machines, tools and equipment used in the performance of the work shall be approved and maintained in satisfactory operating condition. Equipment operating on roads and runways shall display low speed traffic markings and traffic warning lights.

#### 1.4.1 Paint Application Equipment

The equipment to apply paint to pavements shall be a self-propelled or mobile-drawn pneumatic spraying machine with suitable arrangements of atomizing nozzles and controls to obtain the specified results. The machine shall have a speed during application not less than 5 mph, and shall be capable of applying the stripe widths indicated, at the paint coverage rate specified in paragraph APPLICATION, and of even uniform thickness with clear-cut edges. The paint applicator shall have paint reservoirs or tanks of sufficient capacity and suitable gauges to apply paint in accordance with requirements specified. Tanks shall be equipped with suitable air-driven mechanical agitators. The spray mechanism shall be equipped with quick-action valves conveniently located, and shall include necessary pressure regulators and gauges in full view and reach of the operator. Paint strainers shall be installed in paint supply lines to ensure freedom from residue and foreign matter that may cause malfunction of the spray guns. The paint applicator shall be readily adaptable for attachment of an air-actuated dispenser for the reflective media approved for use. Pneumatic spray guns shall be provided for hand application of paint in areas where the mobile paint applicator cannot be used.

#### 1.4.2 Thermoplastic Application Equipment

##### 1.4.2.1 Thermoplastic Material

Thermoplastic material shall be applied to the primed pavement surface by

spray techniques or by the extrusion method, wherein one side of the shaping die is the pavement and the other three sides are contained by, or are part of, suitable equipment for heating and controlling the flow of material. By either method, the markings shall be applied with equipment that is capable of providing continuous uniformity in the dimensions of the stripe.

#### 1.4.2.2 Application Equipment

a. Application equipment shall provide continuous mixing and agitation of the material. Conveying parts of the equipment between the main material reservoir and the extrusion shoe or spray gun shall prevent accumulation and clogging. All parts of the equipment which come into contact with the material shall be easily accessible and exposable for cleaning and maintenance. All mixing and conveying parts up to and including the extrusion shoes and spray guns shall maintain the material at the required temperature with heat-transfer oil or electrical-element-controlled heat.

b. The application equipment shall be constructed to ensure continuous uniformity in the dimensions of the stripe. The applicator shall provide a means for cleanly cutting off stripe ends squarely and shall provide a method of applying "skiplines". The equipment shall be capable of applying varying widths of traffic markings.

c. The applicator shall be equipped with a drop-on type bead dispenser capable of uniformly dispensing reflective glass spheres at controlled rates of flow. The bead dispenser shall be automatically operated and shall begin flow prior to the flow of composition to assure that the strip is fully reflectorized.

#### 1.4.2.3 Mobile and Maneuverable

Application equipment shall be mobile and maneuverable to the extent that straight lines can be followed and normal curves can be made in a true arc.

The equipment used for the placement of thermoplastic pavement markings shall be of two general types: mobile applicator and portable applicator.

a. Mobile Application Equipment: The mobile applicator shall be defined as a truck-mounted, self-contained pavement marking machine that is capable of hot applying thermoplastic by either the extrusion or spray method. The unit shall be equipped to apply the thermoplastic marking material at temperatures exceeding 200 degrees C, at widths varying from 3 inches to 12 inches and in thicknesses varying from .02 inch to .2 inch and shall have an automatic drop-on bead system. The mobile unit shall be capable of operating continuously and of installing a minimum of longitudinal markings in an 8-hour day.

(1) The mobile unit shall be equipped with a melting kettle which holds a minimum of 5953 lb. of molten thermoplastic material. The kettle shall be capable of heating the thermoplastic composition to temperatures of 200 to 230 degrees C. A thermostatically controlled heat transfer liquid shall be used. Heating of the composition by direct flame will not be allowed. Oil and material temperature gauges shall be visible at both ends of the kettle.

(2) The mobile unit shall be equipped with an electronic programmable line pattern control system. The control system shall be capable of applying skip or solid lines in any sequence, through any and



all of the extrusion shoes, or the spray guns, and in programmable cycle lengths. In addition, the mobile unit shall be equipped with an automatic counting mechanism capable of recording the number of lineal meters of thermoplastic markings applied to the pavement surface with an accuracy of 0.5 percent.

b. Portable Application Equipment: The portable applicator shall be defined as hand-operated equipment, specifically designed for placing special markings such as crosswalks, stopbars, legends, arrows, and short lengths of lane, edge and centerlines. The portable applicator shall be capable of applying thermoplastic pavement markings by the extrusion method. The portable applicator shall be loaded with hot thermoplastic composition from the melting kettles on the mobile applicator. The portable applicator shall be equipped with all the necessary components, including a materials storage reservoir, bead dispenser, extrusion shoe, and heating accessories, so as to be capable of holding the molten thermoplastic at a temperature of 200 to 230 degrees C, of extruding a line of width, and in thicknesses of not less than nor more than and of generally uniform cross section.

#### 1.4.3 Preformed Tape Application Equipment

Mechanical application equipment shall be used for the placement of preformed marking tape. Mechanical application equipment shall be defined as a mobile pavement marking machine specifically designed for use in applying precoated, pressure-sensitive pavement marking tape of varying widths, up to 12 inches. The applicator shall be equipped with rollers, or other suitable compactive device, to provide initial adhesion of the preformed, pressure-sensitive marking tape with the pavement surface. Additional hand-operated rollers shall be used as required to properly seat the thermoplastic tape.

#### 1.5 HAND-OPERATED, PUSH-TYPE MACHINES

All machines, tools, and equipment used in performance of the work shall be approved and maintained in satisfactory operating condition. Hand-operated push-type machines of a type commonly used for application of paint to pavement surfaces will be acceptable for marking small streets and parking areas. Applicator machine shall be equipped with the necessary paint tanks and spraying nozzles, and shall be capable of applying paint uniformly at coverage specified. Sandblasting equipment shall be provided as required for cleaning surfaces to be painted. Hand-operated spray guns shall be provided for use in areas where push-type machines cannot be used.

#### 1.6 MAINTENANCE OF TRAFFIC

##### 1.6.1 Roads, Streets, and Parking Areas

When traffic must be rerouted or controlled to accomplish the work, the necessary warning signs, flagpersons, and related equipment for the safe passage of vehicles shall be provided.

### PART 2 PRODUCTS

#### 2.1 PAINT

The paint shall be homogeneous, easily stirred to smooth consistency, and shall show no hard settlement or other objectionable characteristics during a storage period of 6 months. Paints for airfields, roads, and streets

shall conform to FS TT-P-1952, color as selected. Pavement marking paints shall comply with applicable state and local laws enacted to ensure compliance with Federal Clean Air Standards. Paint materials shall conform to the restrictions of the local Air Pollution Control District.

## 2.2 THERMOPLASTIC COMPOUNDS

The thermoplastic reflectorized pavement marking compound shall be extruded or sprayed in a molten state onto a primed pavement surface. Following a surface application of glass beads and upon cooling to normal pavement temperatures, the marking shall be an adherent reflectorized strip of the specified thickness and width that is capable of resisting deformation by traffic.

### 2.2.1 Composition Requirements

The binder component shall be formulated as a hydrocarbon resin. The pigment, beads and filler shall be uniformly dispersed in the binder resin. The thermoplastic composition shall be free from all skins, dirt, and foreign objects and shall comply with the following requirements:

Component	Percent by Weight	
	White	Yellow
Binder	17 min.	17 min.
Titanium dioxide	10 min.	-
Glass beads,	20 min.	20 min.
Calcium carbonate & inert fillers	49 max.	*
Yellow pigments	-	*

\*Amount and type of yellow pigment, calcium carbonate and inert fillers shall be at the option of the manufacturer, providing the other composition requirements of this specification are met.

### 2.2.2 Physical Properties

#### 2.2.2.1 Color

The color shall be as indicated.

#### 2.2.2.2 Drying Time

When installed at 22 degrees C and in thicknesses between 1 inch and .2 inch, the composition shall be completely solid and shall show no damaging effect from traffic after curing 15 minutes.

#### 2.2.2.3 Softening Point

The composition shall have a softening point of not less than 95 degrees C when tested in accordance with ASTM E 28.

#### 2.2.2.4 Specific Gravity

The specific gravity of the composition shall be between 1.9 and 2.2 as determined in accordance with ASTM D 792.

#### 2.2.3 Asphalt Concrete Primer

The primer for asphalt concrete pavements shall be a thermosetting adhesive with a solids content of pigment reinforced synthetic rubber and synthetic plastic resin dissolved and/or dispersed in a volatile organic compound (VOC). Solids content shall not be less than 10 percent by weight at 22 degrees C and 60 percent relative humidity. A wet film thickness of .005 in. plus or minus .001 in., shall dry to a tack-free condition in less than 5 minutes.

#### 2.2.4 Portland Cement Concrete Primer

The primer for Portland cement concrete pavements shall be an epoxy resin primer. The primer shall be of the type recommended by the manufacturer of the thermoplastic composition. Epoxy primers recommended by the manufacturer shall be approved by the Contracting Officer prior to use. Requests for approval shall be accompanied with technical data, instructions for use, and a 1 liter sample of the primer material.

#### 2.3 PREFORMED TAPE

The preformed tape shall be an adherent reflectorized strip in accordance with ASTM D 4505 Type I or IV, Class optional.

#### 2.4 SAMPLING AND TESTING

Materials proposed for use shall be stored on the project site in sealed and labeled containers, or segregated at source of supply, sufficiently in advance of needs to allow 60 days for testing. Upon notification by the Contractor that the material is at the site or source of supply, a sample shall be taken by random selection from sealed containers by the Contractor in the presence of a representative of the Contracting Officer. Samples shall be clearly identified by designated name, specification number, batch number, manufacturer's formulation number, project contract number, intended use, and quantity involved. Testing shall be performed in an approved independent laboratory. If materials are approved based on reports furnished by the Contractor, samples will be retained by the Government for possible future testing should the material appear defective during or after application.

### PART 3 EXECUTION

#### 3.1 SURFACE PREPARATION

Surfaces to be marked shall be thoroughly cleaned before application of the pavement marking material. Dust, dirt, and other granular surface deposits shall be removed by sweeping, blowing with compressed air, rinsing with water or a combination of these methods as required. Rubber deposits, surface laitance, existing paint markings, and other coatings adhering to the pavement shall be completely removed with scrapers, wire brushes, sandblasting, approved chemicals, or mechanical abrasion as directed. Areas of old pavement affected with oil or grease shall be scrubbed with several applications of trisodium phosphate solution or other approved detergent or degreaser, and rinsed thoroughly after each application.

After cleaning, oil-soaked areas shall be sealed with cut shellac to prevent bleeding through the new paint. Pavement surfaces shall be allowed to dry, when water is used for cleaning, prior to striping or marking. Surfaces shall be recleaned, when work has been stopped due to rain.

### 3.1.1 Pretreatment for Early Painting

Where early painting is required on rigid pavements, a pretreatment with an aqueous solution containing 3 percent phosphoric acid and 2 percent zinc chloride shall be applied to prepared pavement areas prior to painting.

### 3.1.2 Cleaning Concrete Curing Compounds

On new Portland cement concrete pavements, cleaning operations shall not begin until a minimum of 30 days after the placement of concrete. All new concrete pavements shall be cleaned by either sandblasting or water blasting. When water blasting is performed, thermoplastic and preformed markings shall be applied no sooner than 24 hours after the blasting has been completed. The extent of the blasting work shall be to clean and prepare the concrete surface as follows:

- a. There is no visible evidence of curing compound on the peaks of the textured concrete surface.

- b. There are no heavy puddled deposits of curing compound in the valleys of the textured concrete surface.

- c. All remaining curing compound is intact; all loose and flaking material is removed.

- d. The peaks of the textured pavement surface are rounded in profile and free of sharp edges and irregularities.

- e. The surface to be marked is dry.

## 3.2 APPLICATION

All pavement markings and patterns shall be placed as shown on the plans.

### 3.2.1 Paint

Paint shall be applied to clean, dry surfaces, and only when air and pavement temperatures are above 5 degrees C and less than 37 degrees C. Paint temperature shall be maintained within these same limits. New asphalt pavement surfaces and new Portland concrete cement shall be allowed to cure for a period of not less than 30 days before applications of paint.

Paint shall be applied pneumatically with approved equipment at rate of coverage specified. The Contractor shall provide guide lines and templates as necessary to control paint application. Special precautions shall be taken in marking numbers, letters, and symbols. Edges of markings shall be sharply outlined.

#### 3.2.1.1 Drying

The maximum drying time requirements of the paint specifications will be strictly enforced to prevent undue softening of bitumen, and pickup, displacement, or discoloration by tires of traffic. If there is a delay in drying of the markings, painting operations shall be discontinued until cause of the slow drying is determined and corrected.

### 3.2.2 Thermoplastic Compounds

Thermoplastic pavement markings shall be placed upon dry pavement; surface dry only will not be considered an acceptable condition. At the time of installation, the pavement surface temperature shall be a minimum of 5 degrees C and rising. Thermoplastics, as placed, shall be free from dirt or tint.

#### 3.2.2.1 Longitudinal Markings

All centerline, skipline, edgeline, and other longitudinal type markings shall be applied with a mobile applicator. All special markings, crosswalks, stop bars, legends, arrows, and similar patterns shall be placed with a portable applicator, using the extrusion method.

#### 3.2.2.2 Primer

After surface preparation has been completed the asphalt and/or concrete pavement surface shall be primed. The primer shall be applied with spray equipment. Primer materials shall be allowed to "set-up" prior to applying the thermoplastic composition. The asphalt concrete primer shall be allowed to dry to a tack-free condition, usually occurring in less than 10 minutes. The Portland cement concrete primer shall be allowed to dry in accordance with the thermoplastic manufacturer's recommendations. To shorten the curing time of the epoxy resins an infrared heating device may be used on the concrete primer.

a. Asphalt Concrete Primer: Primer shall be applied to all asphalt concrete pavements at a wet film thickness of .005 In., plus or minus 0.001 In..

b. Portland Cement Concrete Primer: Primer shall be applied to all concrete pavements (including concrete bridge decks) at a wet film thickness of between .04 In. to .05 In.

#### 3.2.2.3 Markings

After the primer has "set-up", the thermoplastic shall be applied at temperatures no lower than 200 degrees C nor higher than 230 degrees C at the point of deposition.

a. Extruded Markings: All extruded thermoplastic markings shall be applied at the specified width and at a thickness of not less than nor more than 5.0 mm.

b. Sprayed Markings: All sprayed thermoplastic markings shall be applied at the specified width and the thicknesses designated in the contract plans. If the plans do not specify a thickness, centerline markings shall be applied at a wet thickness of .09 In., plus or minus .005 In., and edgeline markings at a wet thickness of .06 In., plus or minus .0005 In.

#### 3.2.3 Preformed Tape

The pavement surface temperature shall be a minimum of 16 degrees C and the ambient temperature shall be a minimum of 16 degrees C and rising. The preformed markings shall be placed in accordance with the manufacturer's written instructions.

### 3.3 MARKING REMOVAL

#### 3.3.1 Equipment Operation

Equipment shall be controlled and operated to remove markings from the pavement surface, prevent dilution or removal of binder from underlying pavement, and prevent emission of blue smoke from asphalt or tar surfaces.

#### 3.3.2 Cleanup and Waste Disposal

The worksite shall be kept clean of debris and waste from the removal operations. Cleanup shall immediately follow removal operations in areas subject to air traffic. Debris shall be disposed of at approved sites.

-- End of Section --

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SECTION 02821

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**04/99**

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SECTION 02821

FENCING

04/99

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 121	(1999) Zinc-Coated (Galvanized) Steel Barbed Wire
ASTM A 153/A 153M	(1998) Zinc-Coated (Hot Dip) on Iron and Steel Hardware
ASTM A 392	(1996) Zinc-Coated Steel Chain-Link Fence Fabric
ASTM A 491	(1996) Aluminum-Coated Steel Chain-Link Fence Fabric
ASTM A 585	(1997) Aluminum-Coated Steel Barbed Wire
ASTM A 780	(1993a) Repair of Damaged and Uncoated Areas of Hot-Dipped Galvanized Coatings
ASTM A 824	(1995) Metallic-Coated Steel Marcellled Tension Wire for Use With Chain Link Fence
ASTM F 626	(1996a) Fence Fittings
ASTM F 900	(1994) Industrial and Commercial Swing Gates
ASTM F 1043	(1999) Strength and Protective Coatings on Metal Industrial Chain-Link Fence Framework
ASTM F 1083	(1997) Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures
ASTM F 1184	(1994) Industrial and Commercial Horizontal Slide Gates

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:



## SD-07 Certificates

### Chain Link Fence;

Statement, signed by an official authorized to certify on behalf of the manufacturer, attesting that the chain link fence and component materials meet the specified requirements.

## SD-10 Operation and Maintenance Data

Electro-Mechanical Locks; ,  
Gate Operator; ,  
Six copies of operating and maintenance instructions, a minimum of 2 weeks prior to field training. Operating instructions shall outline the step-by-step procedures required for system startup, operation, and shutdown. The instructions shall include the manufacturer's name, model number, service manual, parts list, and brief description of all equipment and their basic operating features. Maintenance instructions shall include routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guide. The instructions shall include the general gate layout, equipment layout and simplified wiring and control diagrams of the system as installed.

## PART 2 PRODUCTS

### 2.1 FENCE FABRIC

Fence fabric shall conform to the following:

#### 2.1.1 Chain Link Fence Fabric

ASTM A 392, Class 2, zinc-coated steel wire with minimum coating weight of 2.0 ounces of zinc per square foot of coated surface, or ASTM A 491, Type I, aluminum-coated steel wire. Fabric shall be fabricated of 9 gauge wire woven in 2 inch mesh. Fabric height shall be 8 feet. Fabric shall be twisted and barbed on the top selvage and knuckled on the bottom selvage.

#### 2.2 GATES

ASTM F 900 and/or ASTM F 1184. Gate shall be the type and swing shown. Gate frames shall conform to strength and coating requirements of ASTM F 1083 for Group IA, steel pipe, with external coating Type A, nominal pipe size (NPS) 1-1/2. Gate frames shall conform to strength and coating requirements of ASTM F 1043, for Group IC, steel pipe with external coating Type A or Type B, nominal pipe size (NPS) 1-1/2. Gate fabric shall be as specified for chain link fabric. Gate leaves more than 8 feet wide shall have either intermediate members and diagonal truss rods or shall have tubular members as necessary to provide rigid construction, free from sag or twist. Gate leaves less than 8 feet wide shall have truss rods or intermediate braces. Intermediate braces shall be provided on all gate frames with an electro-mechanical lock. Gate fabric shall be attached to the gate frame by method standard with the manufacturer except that welding will not be permitted. Latches, hinges, stops, keepers, rollers, and other hardware items shall be furnished as required for the operation of the gate. Latches shall be arranged for padlocking so that the padlock will be accessible from both sides of the gate. Stops shall be provided for holding the gates in the open position. For high security applications, each end member of gate frames shall be extended sufficiently above the top member to carry three strands of barbed wire in horizontal alignment with

barbed wire strands on the fence.

## 2.3 POSTS

### 2.3.1 Metal Posts for Chain Link Fence

ASTM F 1083, zinc-coated. Group IA, with external coating Type A steel pipe. Group IC steel pipe, zinc-coated with external coating Type A or Type B and Group II, formed steel sections, shall meet the strength and coating requirements of ASTM F 1043. Group III, ASTM F 1043 steel H-section may be used for line posts in lieu of line post shapes specified for the other classes. Sizes shall be as shown on the drawings. Line posts and terminal (corner, gate, and pull) posts selected shall be of the same designation throughout the fence. Gate post shall be for the gate type specified subject to the limitation specified in ASTM F 900 and/or ASTM F 1184.

## 2.4 BRACES AND RAILS

ASTM F 1083, zinc-coated, Group IA, steel pipe, size NPS 1-1/4. Group IC steel pipe, zinc-coated, shall meet the strength and coating requirements of ASTM F 1043. Group II, formed steel sections, size 1-21/32 inch, conforming to ASTM F 1043, may be used as braces and rails if Group II line posts are furnished.

## 2.5 WIRE

### 2.5.1 Tension Wire

Tension wire shall be Type I or Type II, Class 2 coating, in accordance with ASTM A 824.

## 2.6 ACCESSORIES

ASTM F 626. Ferrous accessories shall be zinc or aluminum coated. Truss rods shall be furnished for each terminal post. Truss rods shall be provided with turnbuckles or other equivalent provisions for adjustment. Barbed wire shall be 2 strand, 12-1/2 gauge wire, zinc-coated, Class 3 in accordance with ASTM A 121 or aluminum coated Type I in accordance with ASTM A 585. Tie wire for attaching fabric to rails, braces, and posts shall be 9 gauge steel wire and match the coating of the fence fabric. Miscellaneous hardware coatings shall conform to ASTM A 153/A 153M unless modified.

## PART 3 EXECUTION

### 3.1 INSTALLATION

Fence shall be installed to the lines and grades indicated. The area on either side of the fence line shall be cleared to the extent indicated. Line posts shall be spaced equidistant at intervals not exceeding 10 feet. Terminal (corner, gate, and pull) posts shall be set at abrupt changes in vertical and horizontal alignment. Fabric shall be continuous between terminal posts; however, runs between terminal posts shall not exceed 500 feet. Any damage to galvanized surfaces, including welding, shall be repaired with paint containing zinc dust in accordance with ASTM A 780.

### 3.2 POST INSTALLATION

### 3.2.1 Posts for Chain Link Fence

Posts shall be set plumb and in alignment. Except where solid rock is encountered, posts shall be driven/hammered to the depth indicated on the drawings. Where solid rock is encountered with no overburden, posts shall be set to a minimum depth of 18 inches in rock. Where solid rock is covered with an overburden of soil or loose rock, posts shall be set to the minimum depth indicated on the drawing unless a penetration of 18 inches in solid rock is achieved before reaching the indicated depth, in which case depth of penetration shall terminate. All portions of posts set in rock shall be grouted. Diameters of holes in solid rock shall be at least 1 inch greater than the largest cross section of the post. Concrete and grout shall be thoroughly consolidated around each post, shall be free of voids and finished to form a dome. Concrete and grout shall be allowed to cure for 72 hours prior to attachment of any item to the posts. Group II line posts may be mechanically driven, for temporary fence construction only, if rock is not encountered. Driven posts shall be set to a minimum depth of 3 feet and shall be protected with drive caps when being set. For high security fences, fence post rigidity shall be tested by applying a 50 pound force on the post, perpendicular to the fabric, at 5 feet above ground; post movement measured at the point where the force is applied shall be less than or equal to 3/4 inch from the relaxed position; every tenth post shall be tested for rigidity; when a post fails this test, further tests on the next four posts on either side of the failed post shall be made; all failed posts shall be removed, replaced, and retested at the Contractor's expense.

### 3.3 BRACES AND TRUSS RODS

Braces and truss rods shall be installed as indicated and in conformance with the standard practice for the fence furnished. Horizontal (compression) braces and diagonal truss (tension) rods shall be installed on fences over 6 feet in height. A center brace or 2 diagonal truss rods shall be installed on 12 foot fences. Braces and truss rods shall extend from terminal posts to line posts. Diagonal braces shall form an angle of approximately 40 to 50 degrees with the horizontal. No bracing is required on fences 6 feet high or less if a top rail is installed.

### 3.4 TENSION WIRES

Tension wires shall be installed along the top and bottom of the fence line and attached to the terminal posts of each stretch of the fence. Top tension wires shall be installed within the top 4 inches of the installed fabric. Bottom tension wire shall be installed within the bottom 6 inches of the installed fabric. Tension wire shall be pulled taut and shall be free of sag.

### 3.5 CHAIN LINK FABRIC

Chain link fabric shall be installed on the side of the post indicated. Fabric shall be attached to terminal posts with stretcher bars and tension bands. Bands shall be spaced at approximately 15 inch intervals. The fabric shall be installed and pulled taut to provide a smooth and uniform appearance free from sag, without permanently distorting the fabric diamond or reducing the fabric height. Fabric shall be fastened to line posts at approximately 15 inch intervals and fastened to all rails and tension wires at approximately 24 inch intervals. Fabric shall be cut by untwisting and removing pickets. Splicing shall be accomplished by weaving a single picket into the ends of the rolls to be joined. The bottom of the installed fabric shall be 1 plus or minus 1/2 inch above the ground. For

high security fence, after the fabric installation is complete, the fabric shall be exercised by applying a 50 pound push-pull force at the center of the fabric between posts; the use of a 30 pound pull at the center of the panel shall cause fabric deflection of not more than 2-1/2 inches when pulling fabric from the post side of the fence; every second fence panel shall meet this requirement; all failed panels shall be resecured and retested at the Contractor's expense.

### 3.6 GATE INSTALLATION

Gates shall be installed at the locations shown. Hinged gates shall be mounted to swing as indicated. Latches, stops, and keepers shall be installed as required. Padlocks shall be attached to gates or gate posts with chains. Hinge pins, and hardware shall be welded or otherwise secured to prevent removal. 3.7 GROUNDING

Fences shall be grounded on each side of all gates, at each corner, at the closest approach to each building located within 50 feet of the fence, and where the fence alignment changes more than 15 degrees. Grounding locations shall not exceed 650 feet. Each gate panel shall be bonded with a flexible bond strap to its gate post. Fences crossed by powerlines of 600 volts or more shall be grounded at or near the point of crossing and at distances not exceeding 150 feet on each side of crossing. Ground conductor shall consist of No. 8 AWG solid copper wire. Grounding electrodes shall be 3/4 inch by 10 foot long copper-clad steel rod. Electrodes shall be driven into the earth so that the top of the electrode is at least 6 inches below the grade. Where driving is impracticable, electrodes shall be buried a minimum of 12 inches deep and radially from the fence. The top of the electrode shall be not less than 2 feet or more than 8 feet from the fence. Ground conductor shall be clamped to the fence and electrodes with bronze grounding clamps to create electrical continuity between fence posts, fence fabric, and ground rods. After installation the total resistance of fence to ground shall not be greater than 25 ohms.

-- End of Section --